

DOCUMENT RESUME

ED 036 312

PS 001 538

AUTHOR DEUTSCH, MARTIN; AND OTHERS
TITLE INSTITUTE FOR DEVELOPMENTAL STUDIES INTERIM PROGRESS REPORT. PART II: RESEARCH AND EVALUATION.
INSTITUTION NEW YORK UNIV., N.Y. INST. FOR DEVELOPMENTAL STUDIES.
SPONS AGENCY OFFICE OF EDUCATION (DHEW), WASHINGTON, D.C. BUREAU OF ELEMENTARY AND SECONDARY EDUCATION.
PUB DATE NOV 68
NOTE 239P.

EDRS PRICE MF-\$1.00 HC-\$12.05
DESCRIPTORS AUDITORY DISCRIMINATION, AUDITORY TRAINING, BEGINNING READING, COGNITIVE DEVELOPMENT, *COMPENSATORY EDUCATION, CONSERVATION (CONCEPT), *CULTURAL DISADVANTAGE, ENRICHMENT PROGRAMS, INTELLECTUAL DEVELOPMENT, LANGUAGE DEVELOPMENT, LONGITUDINAL STUDIES, MEASUREMENT INSTRUMENTS, MOTIVATION, *PRESCHOOL CHILDREN, PROGRAM EVALUATION, READING ACHIEVEMENT, *RESEARCH PROJECTS, SELF CONCEPT, *STUDENT CHARACTERISTICS, VISUAL DISCRIMINATION

ABSTRACT

THE INSTITUTE FOR DEVELOPMENTAL STUDIES (IDS) IS ENGAGED IN RESEARCH AIMED AT SPECIFYING WHAT THE ACADEMIC HANDICAPS OF DEPRIVED CHILDREN ARE, WHAT CAUSES THESE HANDICAPS, AND WHAT CAN BE DONE TO OVERCOME THEM. THIS IDS REPORT ON THEIR RESEARCH AND EVALUATION PROGRAM IS DIVIDED INTO TWO SECTIONS. THE FIRST, "SUMMARIES OF BASIC RESEARCH, APPLIED RESEARCH AND EVALUATION," OFFERS A CONDENSED OVERVIEW OF THE WORK OF THE INSTITUTE FOR DEVELOPMENTAL STUDIES. THE SECOND, AN APPENDIX, INCLUDES SUCH DETAILED MATERIAL AS A SELECTION OF COMPLETE REPORTS AND A COMPLETE "BIBLIOGRAPHY OF THE INSTITUTE FOR DEVELOPMENTAL STUDIES." THE ACTUAL WORK REPORTS COVER A WIDE VARIETY OF SUBJECTS RELATED TO POVERTY AND EARLY CHILDHOOD EDUCATION: LANGUAGE DEVELOPMENT, AUDITORY DISCRIMINATION, PHONEMIC DISCRIMINATION, CONSERVATION, COGNITIVE DIFFERENTIATION, KINDERGARTEN CURRICULUM, BEGINNING READING, VISUAL DISCRIMINATION OF ALPHABET LETTERS, AND DEVELOPMENT OF PRESCHOOL OBSERVATION TECHNIQUES. OTHER AREAS EXPLORED ARE SELF-CONCEPT, CLASSROOM INTEGRATION, AND USE OF EARLY CHILDHOOD INVENTORIES. ONE CONSISTENT FINDING IS THAT LASTING CHANGES CAN'T BE EXPECTED UNLESS INTERVENTION EXTENDS AT LEAST THROUGH THE THIRD GRADE. (MH)

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INSTITUTE FOR DEVELOPMENTAL STUDIES
School of Education
New York University

Interim Progress Report

Part II

RESEARCH AND EVALUATION

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Director

November, 1968

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Institute for Developmental Studies
School of Education
New York University

Interim Progress Report

November, 1968

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Institute for Developmental Studies
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Interim Progress Report - Part II

Introduction

Founded in 1958 and, since 1966 part of the School of Education of New York University, the Institute for Developmental Studies has pioneered in the field of education for young children from socially disadvantaged backgrounds. As a result of its own examination of the causes and nature of social disadvantage and its resultant impact on learning, and the work of others in this area, the Institute, in 1962, began a program of educational intervention at the preschool level. Soon recognizing that continuous reinforcement is essential if early gains are to be maintained and elaborated, the Institute in 1964 extended its demonstration program through third grade. This extended program now comprises 14 classes in four public schools in the Harlem area of New York City.

In Part I of our Interim Progress Report to the Ford Foundation (November, 1967), we described the Institute's work in curriculum development, in-service training for teachers of its enrichment classes, extra-mural training in communities throughout the country and abroad, and the Institute parent program which aims at involving parents and the community in the education process of their children.

The present report -- Part II -- is concerned with the research

and evaluation aspects of our comprehensive program and includes all major efforts in these two areas in recent years. Based on the assumption that the child's potential intelligence is not fixed at birth and that his development depends on the quality of his early interaction with the world around him, Institute scientists are actively investigating such variables as socioeconomic status, race, family composition and living arrangements, child rearing practices and language styles as they affect the child's cognitive development.

In one of the Institute's first research projects, the Verbal Survey, 165 fifth- and 127 first-grade children, Negro and white, from various socioeconomic classes, were tested to determine what factors were related to the development of linguistic and cognitive abilities. This survey revealed that the most significant variations in children's verbal skills were directly related to the child's socioeconomic background rather than his race. However, in society these two factors are confounded since Negroes tend to be poorer than whites. Thus, the findings of this study supplied further evidence of the damaging effects of social inequalities in our society.

In its applied research program, the Institute has committed itself to bridging the discontinuity between the experiences of the disadvantaged environment and the middle-class culture of the schools. Since it has been shown again and again that children of poverty live in depressed environments that fail to provide them with the kind of stimulation that fosters verbal and cognitive skills, much of the Institute's research is aimed at developing

concrete intervention procedures that provide the linguistic and conceptual foundation that is essential to school learning, assuming that the school as a system can be oriented to meet the needs of these children.

Our research, then, is aimed at specifying what the learning disabilities of the disadvantaged child are, what causes them, and what can be done to overcome them. Through our demonstration program, we try to work these problems out concretely both in the classroom and in the school. To measure the effectiveness of its methods, the Institute carries on an intensive program of evaluation at all stages, using both standardized and Institute-developed test instruments with experimental and control children.

As part of our longitudinal study of the effectiveness of our intervention procedures, experimental and control children are evaluated on a pre- and posttest basis, starting at the beginning of prekindergarten and continuing at designated intervals until completion of third grade. The evaluation instruments used in this longitudinal study include such standardized tests as the Stanford-Binet Intelligence Scale, the Peabody Picture Vocabulary Test, the Columbia Mental Maturity Scale, the Lorge-Thorndike Intelligence Test, the Gates MacGinitie Reading Test and the Metropolitan Reading Test. In addition, various other measures are used from time to time, ranging from the Illinois Test of Psycholinguistic Abilities to limited range, non-standardized measures of particular curriculum elements. Among the latter are the IDS-developed Phonics Checklist and the Early Childhood Inventories.

Our most recent findings from the longitudinal study (see p. 105) indicate that on the Stanford-Binet and the Peabody Picture Vocabulary Test, the experimental children scored significantly higher than their controls and also improved significantly over their own pretest performance. It is also important to note that on the Illinois Test of Psycholinguistic Abilities (which measures various kinds of language ability), Wave I experimental children scored significantly higher than the control group. Further, the difference between the groups was greater in third grade than in earlier testings; the scores of the control group, on the other hand, declined from first to third grade. The progressive decrease of the ITPA scores of the control group shows the cumulative deficit often found to characterize the disadvantaged child. The increase in the scores of experimental children as late as third grade, however, suggests that the cumulative effect of a disadvantaging environment can be avoided by the use of effective intervention procedures.

On the Reading Achievement tests (see p. 99) experimental children maintain their superiority over control children.

The results so far of the use of the Early Childhood Inventories (see p. 78) are also hugely encouraging. On a battery of six specially constructed assessment instruments, five of which measure verbal and non-verbal naming skills (alphabet, numeral, color, shapes, and body parts) and one which measures mastery of same/different concepts, Institute children at kindergarten and first grade are clearly superior to their comparison groups, including a Head Start group at the kindergarten level. The Head

Start group was superior to the remaining comparison group, but not to the same extent as the Institute enrichment children. Moreover, Institute children at the kindergarten level are equivalent to first-grade children who have had regular public school kindergarten experience and superior to first-graders who have had no kindergarten experience.

Objective evaluative data are essential, but human response cannot always be measured by objective standards. The reaction to the Institute's program by the parents of the children involved has been overwhelmingly positive. As one parent stated: "They work with us in helping with our problems.... They understand the children, they don't call them crazy." Or another: "Because of the lesson plans at the Center [the parent center] ... I am able to converse with my children. Before this I was very much embarrassed when my children would ask me questions.... But now I can talk with them and don't feel embarrassed. I now have confidence in myself and feel secure."

Faced with the prospect of having their children enter regular public school fourth grade after completing the Institute classes, parents have repeatedly requested that we extend the program into higher grades. Community support of the Institute's activities was also vividly evident at a recent ceremony held at New York University honoring third graders "graduating" from the enrichment program, their parents, and teachers.

The report that follows has been organized in two sections for the convenience of the reader. The first section, Summaries of

Basic Research, Applied Research and Evaluation, provides the reader with a condensed overview of the Institute's work in these two areas. The second section is an Appendix, which includes a selection of complete reports from which these summaries were drawn and which exemplify the more detailed material available from the Institute. The Appendix also includes a complete Bibliography of the Institute for Developmental Studies. To provide the reader with a complete picture of the Institute's program, the Table of Contents of Part I of this report has also been included in the Appendix.

We gratefully acknowledge the cooperation of the Institute staff in the compilation of this report and also the support of the following funding agencies which have made the Institute's work possible:

- Office of Education
- Office of Economic Opportunity
- National Institute of Mental Health
- National Institute for Child Health and Human Development
- New York City Board of Education
- Association for the Aid of Crippled Children
- The Taconic Foundation
- The Ford Foundation
- Carnegie Corporation
- The Stern Family Fund
- The Aquinas Fund
- Sloan Foundation
- Mobilization for Youth
- Van Leer Foundation

In addition, the work of the Institute has been supported by a number of private donors.

Last, but not least, we wish to extend our special thanks to the many children, their parents, and members of the community who have participated so enthusiastically in our experimental program.

Institute for Developmental Studies
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SUMMARIES

Basic Research

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Verbal Survey

Abstract of: Whiteman, M., and Deutsch, M. "Social Disadvantage as Related to Intellectual and Language Development."*

The "Verbal Survey" is a cross-sectional study of 165 fifth- and 127 first-grade children with respect to their performance on a variety of verbal measures. A major aim of the study is the identification of some of the specific background variables which are related to the development of linguistic and cognitive skills.

The samples were drawn from twelve schools in New York City. These schools were selected to provide a population varying in socioeconomic status (SES) and race (Negro and white). One school also provided a sample with comparable SES variation within each of the races. The SES categorization was derived from the education of the family's main support and his occupation as assessed by the Empey Scale of Occupational Prestige.

Census comparisons revealed that the schools designated as lower class recruited from populations with lesser schooling (median 8.7 years completed as compared to 10.7 for the more middle-class areas). This difference in educational level was similar

*In Deutsch, M., Katz, I., and Jensen, A. (eds.). Social Class, Race, and Psychological Development. New York: Holt, Rinehart and Winston, Inc., 1968.

in census areas that were predominantly Negro or predominantly white. The educational and income medians for the census areas in which the twelve schools were located are fairly close to the overall New York City figures.

In addition to the actual sample described above, a "synthetic sample" was drawn on a completely random basis from the twelve schools. The IQ's* of the children in the two samples, stratified by SES, race, and sex, were compared and found to be highly similar in distribution. The first- and fifth-grade children in the verbal survey sample were compared on a number of demographic and background conditions -- sex, race, parental education and occupation, presence of father in the home, family size, person-room ratio, kindergarten or day-care experience. The results of this analysis showed a close correspondence between the first- and fifth-graders relative to these factors, suggesting comparability in the procedures for selecting the younger and older children.

In the study of the conditions of social deprivation, both conceptual and empirical steps were involved. The conceptual step was to delineate those environmental conditions which, on an a priori basis, might qualify as social deprivations. Fifteen such conditions were selected from a broader array of thirty background factors. These fifteen factors included motivational variables (e.g., the amount of schooling the parent desires for the child); family structure (e.g., whether or not there is a father in the home); variables related to child's interaction with parent; to activities with adults; and to school experiences. The empirical

*The Lorge-Thorndike (nonverbal).

step involved study of each of these variables from two vantage points: 1) whether it is related to an important psychological function, such as reading, and 2) whether it is related to an important social grouping, such as SES. Those environmental variables associated with lower SES and lower reading score were defined as social deprivations. There were six such variables which were combined into a composite score -- A Deprivation Index. A more "deprived" score was obtained by children with a cumulation of the following: the children tended to have missed kindergarten; their families were larger, perhaps more crowded, and located in more dilapidated neighborhoods; the parents had lower educational aspirations for their children; more limited "cultural activities" with parents or relatives; more limited conversations at dinner.

The following conclusions emerge from a number of analyses involving SES, variables related to environmental background, reading score, and three tests most highly correlated with reading achievement (IQ, WISC Vocabulary, Orientation Scale -- which taps range of information):

1. The correlation between the ability tests and the achievement variable, reading, is higher than the correlation between environmental conditions and reading. This suggests that these abilities may be exerting a more direct influence on reading than the more "distant" background variables.
2. The interrelationships among the environmental conditions tend to be low (median $r = .17$). The implication is that these conditions are prone to show a fair degree of independence from one

another. This suggests that environmental conditions exert their maximum effect on abilities and on achievement by means of their cumulative interaction rather than as separate representatives of some one underlying deprivational condition.

3. The correlations among the three ability tests -- IQ, WISC Vocabulary, and Orientation Scale -- hover about the .70 mark. These correlations and data from a factor analysis are consistent with: a) the notion of a common factor loading the three ability tests, and b) the conception that intellectual abilities underlie and are related to reading achievement, but that the two areas -- ability and achievement -- represent separate functional unities.

Analyses involving the Deprivation Index yielded the following results:

1. On both the WISC Vocabulary and the Lorge-Thorndike IQ measures, the Deprivation Index yielded cumulative deficits. Thus, the more disadvantaged group shows a lower IQ among the older children as compared to the younger children, while the relatively advantaged group shows an increase in IQ among the older children as compared to the younger children. A similar pattern occurs with respect to a cumulative vocabulary deficit.
2. Cumulative deficits on the verbal test (vocabulary) are associated with a broader range of background conditions than those on the more non-verbal IQ measure. For example, there is no cumulative deficit associated with lower SES on the Lorge-Thorndike IQ, but there is a significant cumulative deficit associated with lower SES

on the vocabulary measure. These and other reported findings point to the greater sensitivity of the language test to different patterns of disadvantage, whether these disadvantages are related to socioeconomic level or to Negro status, or to the specific background factors implied in the Deprivation Index.

3. The more deprived children, as assessed by the Deprivation Index, had the less positive self-concepts, as assessed by sentence completion items.*

4. The self-concept variable was related to four test scores. Each test score represented a marker variable for a different factor. The results indicated that the relation between more negative self-concept and lower test score was fairly general and obtained over the four tests used in the analysis -- the Lorge-Thorndike, the Form-Class Score of a word association test, the Cloze measure (tapping ability to supply the missing word in a sentence), and the Word Distance measure (based on the subject's ability to select the words whose meanings fit those of stimulus words).

5. A more advantaged environment, as assessed by the Deprivation Index, tended to counteract other conditions which tend to bring achievement levels down. To illustrate:

a. Among the fifth-graders, SES differences in language measures and on the Lorge-Thorndike IQ are not significant in the group showing lesser disadvantage, though they are significant in the more deprived group.

b. Reading differences associated with IQ score are less pronounced in the group with a lesser degree of deprivation. In the

*For example: "I get into trouble when _____";
 "When I look in the mirror, I _____."

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more disadvantaged group, the relation between lower reading score and IQ is stronger.

c. Among the first-graders, Negro children of higher SES level and lesser deprivation do not score lower than comparable white children. In the more disadvantaged groups (defined by lower SES and more "deprived" scores on the Deprivation Index), the Negro children tend to score lower.

6. The data suggest a distinction between the effects of race and SES. Thus, these two background factors show different relationships with the Lorge-Thorndike. The SES deficit begins earlier and is as pronounced among the younger first-graders as among the older fifth-graders. The decrement associated with race, however, begins later and is more cumulative and more pronounced among the older Negro children. The sample selection as well as the mode of statistical analysis has aimed at separating these two factors -- race and SES. But in society they are confounded. Negroes tend to be poorer than whites. The implication is that the Negro child may be sequentially disadvantaged. Factors associated with low SES may produce early deficit.

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Auditory Discrimination

Based on: Deutsch, Cynthia. "The Development of Auditory Discrimination: Relationship to Reading Proficiency and to Social Class."*

Previous Institute studies have shown that poor readers tend to have significantly poorer auditory discrimination skills than do good readers. With the high incidence of reading retardation among children from lower socioeconomic status backgrounds, it is important to learn if a major intervening variable between social conditions and reading retardation is poor auditory discrimination.

A main objective of this project is to determine if there are social class differences in auditory discrimination ability. A second objective is to determine the prevalence of auditory discrimination difficulties coincident with different levels of reading skills within and between class groupings, while a third objective is concerned with exploring the possible relationships between levels of auditory discrimination skills and visual perceptual skills involved in reading.

The subjects are 180 white and Negro boys from lower and middle socioeconomic status (SES) backgrounds measured by the Institute's SES scale and drawn from the first, third, and fifth grades in New York City public schools. There are twelve groups of 15 sub-

*Progress Report to the Department of Health, Education, and Welfare, March, 1968. Principal Investigator: Cynthia Deutsch.

jects each, categorized as follows:

1. Lower SES, white 1st grade
2. Lower SES, Negro 1st grade
3. Middle SES, white 1st grade
4. Middle SES, Negro 1st grade
5. Lower SES, white 3rd grade
6. Lower SES, Negro 3rd grade
7. Middle SES, white 3rd grade
8. Middle SES, Negro 3rd grade
9. Lower SES, white 5th grade
10. Lower SES, Negro 5th grade
11. Middle SES, white 5th grade
12. Middle SES, Negro 5th grade

Extensive surveying of a large number of schools in different areas of New York City has been necessary to obtain a sufficient number of children to make up the comparison groups.

Since project emphasis is on the auditory modality, considerable attention is given to auditory testing. The testing proceeds from the level of simply responding to the presence or absence of auditory stimulation (audiometric testing), to the level of perceptual recognition of complex auditory stimuli (masking tests), to verbal discrimination among similar sounding words (Wepman test).

A. The auditory testing includes:

1. Auditory screening: A standard audiometric test is administered to those children for whom school authorities have no audiometric record.

2. I.D.S. Pitch Discrimination Test: pilot study results indicated that the Seashore test, which we had originally planned to use, would not be appropriate. Therefore, we constructed a pitch discrimination test which requires only a response of "same" or "different" (unlike the Seashore, which demanded a "higher" or "lower" designation) and makes it consistent with the Wepman Auditory Discrimination Test.

3. Auditory Masking Tests

a. Masking Test I: A word is played simultaneously with a white noise mask. The intensity of the white noise is initially at its highest level, and is gradually reduced until, on the final presentation, the stimulus is presented with no noise mask. Each stimulus-noise presentation is followed by a silent period during which the S is encouraged to identify the stimulus.

b. Masking Test II: A word is masked by a word. The procedure and scoring are the same as for the previous masking test.

c. Masking Test III: Nonsense syllables are masked by white noise. The procedure and scoring are fundamentally like those for the other masking tests.

4. Wepman Auditory Discrimination Test: This test may be considered a basic measure of verbal discrimination. It consists of 40 tape recorded pairs of words, of which ten are identical and thirty differ by one phoneme only: 13 differ in the initial phoneme, 13 differ in the final phoneme, and 4 differ in the medial phoneme. The task of the child is to state whether the words in

each of the pairs are the "same" or "different." Error scores are computed for initial and final phoneme differences separately, and for the entire test.

B. Visual Discrimination Measure.

The multiple-choice Bender-Gestalt Test was selected as the measure of visual discrimination. This is a test devised by Wepman and Weiner and is currently in experimental use. They have kindly permitted its use in this study. In this test the standard Bender-Gestalt designs plus five new designs (which increases the reliability of the test) are shown one at a time to the subject. After the presentation of each item, the presented design is replaced by a card containing four designs, one of which is identical and three of which are similar to the presented standard. The subject is asked to indicate the one which is identical to the design he has just seen. The second part of the test is a matching-recognition task, using the same stimuli but presenting the standard and the choices simultaneously. A correct score is computed for each part of the test and can be compared with the tentative norms available.

The test requires no drawing or other reproductive motor skill -- only visual perception and memory are involved. This measure is included to yield some information on the relationship between the auditory and visual modalities.

C. Attention Measure.

The Institute version of the Continuous Performance Test (CPT) is used to measure vigilance or attention. Previous Institute

studies have shown a significant relationship between performance on this test and good reading performance. This test presents, via tape-recordings, a series of color names. The subject is required to respond to only one color name, "red," by pressing a button which is linked to a timer which records his response latency. Scores include, in addition to latency, the number correct and incorrect presses, and the number of missed responses (i.e., the number of times the subject did not respond to "red").

D. Reading Tests.

1. Gates Diagnostic Battery: These are widely available standardized tests. The appropriate forms were selected for the third and fifth grade children. The third grade group is given the Gates Advanced Primary Reading Test, Type ARP, "Reading for Grade 2 (second half) and Grade 3." The fifth grade group is given the Gates Basic Reading Survey, Type GS, "Reading to Appreciate General Significance for Grade 3 (second half) through 8."

2. The Institute Reading Prognosis Test: This test is used with the first grade children who have not yet learned to read. It consists of six subtests relating to perceptual discrimination, language, and beginning reading skill, and correlates very highly with end-of-first-grade reading level.

E. Intelligence Measures:

The Lorge Thorndike Intelligence tests are administered to all subjects. The first grade is given Primary Battery, Level 1, Form A; the third grade gets Primary Battery, Level 2, Form A; the fifth grade is given Verbal Battery, Level 3, Form A. The scores will be used as a covariant in the

data analysis.

Data collection and data analysis have been completed for this study. A final report is in preparation.

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New York University

Phonemic Discrimination

Abstract of: Collier, A.R., Coleman, R., and Schwartz, S., "The Relationship between Initial and Final Consonants in a Bi-Positionally Balanced, Paired Speech-Sound Test: A Discrimination or Set Problem for Disadvantaged Children?"*

The Wepman Auditory Discrimination Test (WADT) is one of the more widely used tests purporting to measure auditory discrimination. The WADT consists of two equated forms, each containing forty word-pairs; word-pairs used in one form do not occur in the other form. In each form there are thirty pairs of words which differ by a single phoneme and ten word pairs which do not differ. "Different" word-pairs differ from one another in either the initial or final consonant (e.g., pool-tool, shot-shop), or in the medial vowel (e.g., pet, pit).

Exploratory studies at the Institute indicated that disadvantaged subjects typically obtain higher scores for the set of word-pairs with the phonemic change in the initial position than for word-pairs with the phonemic change in the final position. One implication of such results is that the two sets of word-pairs may be measuring different behaviors.

*The complete report on this study, to date, is included in the Appendix, p. 116.

Another finding, with particular implications for understanding the effects of disadvantaging environments, is the finding that disadvantaged children tend to have poorer "auditory discrimination," as measured by the WADT, than do non-disadvantaged children.

These preliminary findings led us to a study designed to meet several objectives:

1. to replicate, extend, and explain the exploratory findings described above. (To some extent, this represents an examination of the validity of the WADT, especially for disadvantaged population),
2. to examine the equivalent forms of the WADT,
3. to assess the reliability of the WADT, with repeated testings and equivalent forms.

Since the focus of the study was on the disadvantaged, the sample included only children of the lowest SES, as measured by the Institute's Index of Socioeconomic Status. The sample consisted of 128 English-speaking, Negro boys and girls in the first grade in four schools in Harlem. The WADT was administered to each subject in tape-recorded form.

As expected, the disadvantaged children of the study obtained significantly higher scores on word-pairs with initial changes than on word-pairs with final changes. This scoring pattern suggests that certain children do not treat the final parts of word-pairs as effective stimuli, but do respond to the initial parts of word-pairs. To address the WADT specifically, word-pairs with changes in final phonemes may not be appropriate materials to measure auditory discrimination in certain children.

No difference was found between the equivalent forms of the

WADT; this result, along with our earlier findings, suggests that the differential scoring of disadvantaged children on final vs. initial phoneme changes is a true difference, rather than the result of some idiosyncratic feature of Form I.

Reliability data have been collected and currently are undergoing statistical analysis.

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Conservation Studies

Based on: Whiteman, M., and Peisach, Estelle. "Conservation Scaling by the Introduction of Perceptual & Sensori-motor Cues." (mimeo)

Peisach, Estelle, and Wein, N. "Relationship of Conservation Explanations to Item Difficulty."* (mimeo)

Peisach, Estelle. "Relationship Between Knowledge of Dimensional Language and Achievement of Conservation." (mimeo)

Several approaches to the study of "conservation" have been explored at the Institute for Developmental Studies.

Piaget views the development of intellectual functioning as a progression of discontinuous, qualitatively different stages. Each stage is achieved through the reorganization of existing internal cognitive structures as a consequence of interaction between the organism and the environment. According to Piaget, around the age of seven the child enters the stage of "concrete logical operations." He becomes capable of performing certain logical operations, provided that these operations involve concrete objects or an immediately present reality. One concrete logical operation is conservation, i.e., recognition that arrangement of materials, such as

*The complete report of this study is included in the Appendix, p. 133.

blocks or plasticine, does not change the number or weight or volume of the materials. In other words, conservation may be an indicator that a crucial step has been achieved in the transition from perceptual to conceptual thinking.

Some studies have indicated that this transitional process to conceptual thinking is retarded in the lower-class child. Work has been undertaken at the Institute to verify this finding and to explore both the extent and pattern of retardation. In addition, possibilities for training in conservation skills have been studied with a view to their inclusion in the Institute's enrichment curriculum program.

Five studies of conservation will be described here.

Scaling Studies

I. Piaget has introduced the concept of "atomism," recognition of the individual elements of the material, as one component explaining the child's acquisition of conservation of continuous quantities. This interpretation of the contribution of atomism to the acquisition of conservation would be strengthened if it could be demonstrated that conservation of a material which behaves like a continuous quantity, that is, can be poured, yet consists of individual particles, is achieved prior to conservation of a continuous quantity in which the individual particles are not visible.

One hundred eighty white children equally distributed by sex, grade (K, first, and second), and SES level (lower-class and mid-

dle-class) received nine conservation tasks varied by presenting 3 materials: blocks, salt, and water. These materials define a continuum of discontinuous quantities (elements clearly visible) through continuous quantities (elements invisible).

The tasks simultaneously varied by the presentation of both equal and unequal quantities. Specifically, for each material, one item was a presentation of two equal amounts made to appear unequal. One item consisted of unequal amounts made to appear equal, and one item was a presentation of unequal amounts of the materials, where the lesser amount of material was made to appear greater. Thus, there were nine items in all.

By rank-ordering the nine conservation items, it was found that generally, across and within all grades, the block items were the easiest, and the salt and water items rather more difficult.

The analysis of this data is continuing.

II. This study attempted to develop a scale for discontinuous quantities (number) and continuous quantities (mass) by the introduction of perceptual and sensorimotor cues. The subjects were forty-three kindergarten and thirty-one third-grade children, all lower SES Negro children. It was anticipated that item difficulty would be reduced by the introduction of an increasing number of perceptual cues, such as color, and motoric cues, such as the child's participation in rearranging the materials.

The resulting data have now been analyzed and a paper has

been prepared. It was found that the number items, discontinuous quantities, formed a scale under conditions which progressively incorporated perceptual and sensorimotor cues; however, the continuous quantity items did not.

There is some indication in the data that the perceptual cues were of greater assistance to the third graders, whereas motoric cues were of more help to the kindergarten subjects. This latter finding is of considerable interest for the application of various auxiliary learning techniques with similar materials but different age children.

Cumulative Deficit Hypothesis and Conservation

It has been argued that the cumulative deficit in cognitive functioning of disadvantaged children is an artifact arising from test variation by age. Conservation comprehension is manifested with different materials at different ages, thus being unusually well suited for the study of the cumulative deficit hypothesis.

The conservation data obtained from the one hundred eighty children representing SES levels and three grades is now being analyzed for SES difference by grade and material. Two scores are being derived, one representing judgment only, the other dependent on both judgment and explanation.

A repeated measures analysis of variance (SES X GRADE X SCORE) will be computed to examine SES differences as a function of grade, material, and type of score.

Relationship of Conservation Explanations to Item Difficulty

It has been demonstrated that conservation scores based on the child's explanation are lower than scores based merely on judgment or a nonverbal measure and that level of explanation varies with age. However, it has been argued that inadequate explanations may reflect less mature verbal skills, rather than absence of the conservation concept.

If explanations actually reflect different levels of comprehension of the concept of conservation, the frequency of different types of explanations should vary with the difficulty level of the item. For example, more difficult items should more frequently elicit perceptual explanations and less frequently elicit explanations based on an addition-subtraction principle. Finding this type of relationship based on an intrinsic variable such as item difficulty, rather than a more external and possibly irrelevant variable such as age, would be substantial evidence of the integral relevance of the explanation to comprehension of conservation.

To explore this question, the children's judgments obtained in connection with the conservation items administered in the first-mentioned study were scored as "non conservation," "conservation after probing" and "conservation without probing." The items were rank ordered by difficulty level, as "easier" and "more difficult" items. The explanations elicited in connection with the judgment were then categorized as follows:

1. Conservation type explanations - reference to previous condition or addition-subtraction explanation.

2. Counting.
3. Combination responses - conservation response accompanied by dimensional description of the length or width of a display of discontinuous materials or the containers of the continuous materials.
4. Displacement of the materials - e.g., "They're spread out;" "you poured it."
5. Dimensional descriptions.
6. No response or an irrelevant response - e.g., "My mother told me."

The distributions of explanations for easier and more difficult items were then examined relative to conservation judgment score, grade and SES level.

In all grades, for both conservation-type judgments and non-conservation-type, the more difficult items elicited significantly more dimensional explanations. For conservation-type responses in the first and second grades, in contrast to the other response-grade subgroups, classical conservation explanations increased slightly. The repetition of nine tasks seemed to afford the older children, who were closer to complete attainment of the concept of conservation, an opportunity to clarify and consolidate their understanding of the task.

The increase in dimensional responses as a function of greater difficulty level of the items was substantially greater than the decrease in conservation-type responses. The category which decreased most frequently was "Displacement."

To summarize, the changes in response found relative to the difficulty level of the items indicate that inability to express

cogent reasons for conservation is not merely a function of verbal skills, as has at times been suggested, but rather is reflective of a lower level of conservation conceptualization.

Relationship Between Knowledge and Use of Dimensional Language and Achievement of Conservation

Whether language reflects or directs thought has long been debated and studied. In the area of conservation, a number of investigators have studied the effects of training procedures using varying types of verbal cues on the achievement of conservation. In contrast, Piaget has commented that words probably do not lead to better understanding, and can, in fact, be confounding if appropriate operational structures have not yet developed. The Institute's study has been designed to: a) determine what relationship exists between knowledge and use of dimensional language in the absence of experimental intervention, b) use appropriate statistics in making comparisons between conservers and non-conservers.

Language tasks designed to measure knowledge and use of dimensional language were administered to the 180 children who participated in the conservation studies. The following scores were derived from these tasks:

Receptive measures

- 1) Nonconjunctive Dimensional Score - based on the child's ability to indicate by pointing which one of the two objects or sets of materials was described by a dimensional item. For example, when presented with two sponges, one

shorter and wider than the other, the child was asked to point to the wider sponge.

- 2) Conjunctive Dimensional Score - based on the ability of the child to indicate by pointing which one of 4 objects or sets of materials was described conjunctively, e.g., "the set of buttons that has larger and fewer buttons."

Expressive measures

Prior to administration of the receptive tasks, the children were asked to describe sets of materials, pairs of sponges, pairs of candles, and sets of buttons in order to elicit use of dimensional language.

- 3) Expressive Dimensional Score - based on children's use of differentiated and conjunctive dimensional language.
- 4) Same Score - based on the ability of the child to tell how the sets of materials were the same.
- 5) Number of Categories Score - based on the number of different attributes mentioned by the child while telling how objects were the same.

Finally, a measure of the child's qualitative use of dimensional language during the conservation tasks were derived and a Difference Score, Expressive Dimensional Score minus Conservation Dimensional Score was obtained.

Correlations between the language scores and conservation scores revealed that at all three grades and within both the lower and middle SES sample across grades, knowledge and use of dimensional language was related to conservation achievement. These

findings held even when SES level and age were controlled by partial correlation analysis. Of particular interest are the high positive coefficients obtained between receptive knowledge of nonconjunctive dimensional terms and conservation. Previous researchers have not found this relationship. The contradiction in findings can be attributed to the greater sensitivity of the measure of receptive comprehension used in this study.

Comparison of mean difference scores (Expressive Dimensional Score minus Conservation Dimensional Score) for conservers and non-conservers revealed that for both groups the conservation task elicited qualitatively less adequate dimensional language, but this effect was no greater within either group.

This last-mentioned analysis and examination of joint frequency tables, high-low conservation vs. high-low language skill, led the investigator to conclude that there was no evidence to support the general contention that development of operational structure precedes the development of the specific language skills. In contrast, at least among the younger children, the language skill seemed a necessary but not sufficient condition for conservation.

Institute for Developmental Studies
School of Education
New York University

Cognitive Differentiation

Abstract of: "Child Rearing and Cognitive Differentiation in
Lower SES Children"*

One of the major concerns of the Institute has been the enumeration and description of cognitive abilities related to school achievement. Our previous research has dealt with such factors as developmental differences in cognitive abilities and differences between socioeconomic groups. In general, the results indicate that a large proportion of children from lower SES groups, particularly those who are poor readers, may be characterized by such factors as diffuseness of visual and auditory perception, difficulty in clearly differentiating relevant from irrelevant material, restriction of vocabulary, poor knowledge of syntax, a high level of redundancy in speech, and conceptualization limited to associational and functional relationships. These results have been corroborated by data from other researchers, who have noted, in addition, such factors as the inability to delay gratification, and reliance upon tangible rewards.

It is our feeling that these stable and persistent differences

*Progress Report to the Department of Health, Education, and Welfare, Feb. 1968. Principal Investigator: Martin Deutsch, Co-Principal Investigator: Richard Coleman.

are related to certain antecedent environmental conditions which are only partially correlated with SES level. By systematically identifying these conditions and showing their relationship to cognitive abilities, we hope to provide a fuller picture of cognitive development in order to strengthen the basis for rational programs of change.

Objectives

The present study, sponsored by the National Institute of Child Health and Human Development, is designed to investigate the relationship between certain affective and cognitive dimensions of child rearing that exist in lower SES New York City Negro families, and to relate systematic differences in these dimensions to aspects of cognitive differentiation in children from such families. It is our contention that research which deals with either cognitive or affective factors alone does not provide a comprehensive picture of cognitive development. We feel that some combination of affective and cognitive variables constitutes a climate for learning in the home which will be systematically related to cognitive development in children.

Design

In the first part of the study, a recently-developed interview schedule will be used in home interviewing of 180 lower SES Negro mothers of kindergarten children. The responses will be coded and factor-analyzed to determine the relationship between the affective

and cognitive areas, and to characterize distinctly different groups of mothers.

Using an interview schedule further refined on the basis of the results of this first phase of the study, we will then interview a second sample of 180 mothers, and relate their child-rearing practices to certain aspects of cognitive differentiation in their kindergarten children. In this part of the study, children's cognitive differentiation will be measured by tests of visual field articulation, auditory field articulation, future reading competence, general intellectual performance, and by analysis of samples of the children's spontaneous speech.

Results

To date, thirty lower SES Negro mothers of kindergarten children have been interviewed, and the tentative interview schedule used in these initial interviews has been refined on the basis of the data.

The interview included questions related to feeling, roles, formal learning, and institutions. In general, the basic organization of questions for a given area is in five steps:

1. the mother's stated beliefs in that area;
2. the mother's description of some behavior in the area;
3. the mother's feelings about that behavior;
4. the mother's response to the behavior;
5. the mother's feeling about the response.

To illustrate, the following items have been selected from approximately 100 items presently included in the interview.

Interview Schedule

Selected Items

1. Some people feel that it is important for a child not to fight with other children, and other people feel that a child has to fight. Which of these is most like the way you feel?

(Probe)

How strongly do you feel about this? Do you feel it's important or very important?

- 1___ Very important to fight
 2___ Important to fight
 3___ Sometimes important to fight,
 sometimes important not to fight
 4___ Important not to fight
 5___ Very important not to fight
 ___ Don't know

2. Does ___ ever fight with the neighborhood children?

(If NO, Skip to Q3)

(If YES)

About how often? Would you say once in a while, or very often?

- 1___ Never
 2___ Once in a while
 3___ Sometimes
 4___ Fairly often
 5___ Very often
 ___ Don't know

3. How do you feel about ___'s fighting?

(Probe)

Do you usually feel annoyed by it?

(If YES)

Would you say you feel annoyed or really upset?

(If NO)

Would you say you are just not annoyed or that you like it?

- 1___ Really upset
 2___ Annoyed
 3___ Sometimes annoyed,
 sometimes upset
 4___ Not annoyed
 5___ Like it
 ___ Don't know

Interview Schedule (cont.)

Selected Items

4. How do you handle it when
 _____ fights with the neigh-
 borhood children?

(IF MOTHER MENTIONS SOMETHING
 INSTRUMENTAL - TAKING AWAY A
 PRIVILEGE OR POSSESSION - ASK:)

Is this something that makes
 _____ a little disappointed
 or very disappointed?

a) physical

1___ Nothing

2___ Mild (pulls away, slaps, etc.)

3___ Strong (beats)

___ Don't know

b) instrumental

1___ Nothing

2___ Mild

3___ Strong

___ Don't know

c) verbal

1___ Asks to stop, giving reason

2___ Tells to stop, no reason

3___ Threatens physical/
 instrumental punishment

4___ Strong scolding, yelling

5___ Nothing

___ Don't know

Interview Schedule (cont.)

Selected Items

5. How do you feel about saying/
doing this?

(Probe)

When you say/do this, is it what
you feel like doing or what you
think you should do?

(IF WHAT SHE FEELS LIKE)

Is this somewhat more what you
feel like, or exactly what you
feel like doing?

(IF WHAT SHE THINK SHE SHOULD)

Is this somewhat more what you
should do, or exactly what you
think you should do?

- 1__ Exactly what she felt like
2__ Somewhat more what felt like
3__ Mixed
4__ Somewhat more what should
5__ Exactly what should do
__ Don't know

SUMMARIES

Applied Research and Evaluation

Institute for Developmental Studies
School of Education
New York University

Kindergarten Curriculum

Based on: Gotkin, L.G. "Cognitive and Motivational Development in Kindergarten Children."*

Since 1963, the Institute for Developmental Studies has been conducting an investigation of the impact of special kindergarten programs on the cognitive and motivational development of children from socially disadvantaged backgrounds. The primary objectives of the project have been:

1. To produce specifiable and reproducible curricula relevant and appropriate to the cognitive deficiencies of children from socially disadvantaged backgrounds. The activities must be in harmony with the age and operational level of young children. Furthermore, they should be individualized to permit each child to work at his own pace and cognitive level.

2. To develop independent learners. In order to achieve classes in which children work at different cognitive activities and at their own pace, the children must be able to function as independent learners. Part of the curriculum is addressed to the task of teaching the necessary skills for independent learning.

*Progress Reports to the National Institute of Mental Health.

While these skills are necessary for classroom management in that they enable the children to utilize independent activities, the achievement of these skills represents an important objective in itself.

3. To produce curricula that are manageable by a single kindergarten teacher. The problem with many training techniques is that they are not manageable in a classroom setting with very young children. Our approach to curriculum innovation involves three steps: a) testing the content, method, and instructions with individual children to check their appropriateness; b) adapting the innovation for the classroom and testing it in a single classroom to solve the problems of classroom management; and c) providing all Institute teachers with the materials, their purposes, and directions for classroom use.

4. To assess the impact of these curricula on the children by means of general measures of intelligence and predictors of reading achievement.

The curriculum innovations emerging directly or indirectly from this project have been described in detail in our Interim Report to the Ford Foundation, Part I, November, 1967, in the "Prekindergarten and Kindergarten Program" section (esp. "Room Arrangement" (p. 44), "The Letter Form Board" (p. 56), "Language Lotto" (p. 65), "Listening Centers" (p. 118).

The Longitudinal Evaluation Program, described in this report on p. 105, is the major evaluation effort related to this project.

In addition, The Development of a Beginning Reading Skills Program on p. 34 provides valuable evaluation of specific curriculum procedures.

Institute for Developmental Studies
School of Education
New York University

Beginning Reading and ERE

Based on: Gotkin, L., McSweeney, J., and Richardson, E. "The Development of a Beginning Reading Skills Program Using the Edison Responsive Environments Instrument"*

Applied Research

This project has as its goal the development of a reading skills program making use of a complex teaching machine, the Edison Responsive Environments Instrument.¹ We do not pretend that our goal is to teach children to read. Rather, we have been taking a painstaking look at the acquisition of a sequence of complex beginning reading skills. In the way we are doing this, we may well be carrying on the most completely controlled study of beginning reading yet conducted. In suggesting this possibility we do not claim that ours is the most relevant reading study or the most complete, but that it is one of the most detailed and clearly controlled in tracking the processes of acquisition. The sources for this claim are two-fold. First, by working with children from disadvantaged backgrounds and by careful pretesting, we know we are dealing with children who have little or no knowledge of the skills being taught.

*Progress Reports to the Office of Education, September, 1967 and June, 1968. Principal Investigators: Lassar Gotkin and Joseph McSweeney. The complete Sept 1967 report is available from EDRS (ED 015 842) MF-\$0.50; HC-\$3.35, 65p.

¹Proper corporate identification: The "Talking Typewriter" of Responsive Environments Corporation.

Second, by using completely individualized presentations in a controlled setting, we are in complete control of the instructional events. Furthermore, the children do not receive concurrent reading instruction in their classrooms.

A problem we faced early in our work was how to maintain attention to the audiovisual stimuli which were essential in producing the responses necessary for us to interpret the progress of both the child and our own techniques. A group of techniques which have helped us maintain attention to the audiovisual stimuli involve motivational contexts. Each of our lessons has some context, a story, game, or series of interesting illustrations, which carries the content behavior, for example:

1. Animation: as in projecting a plain letter in some animated fashion as opposed to a still display.
2. Role Playing: as when the machine voice places the child in the simulated role of teacher.
3. Operational Control: as when the child initiates some animated sequences by a button press.

In some lessons, letter images and their sounds are used as labels and names for animals, characters, and objects. In still others, a skill event (oral sound response to letter image) is followed by a story event, etc., in the fashion of television programming where commercial and program follow each other as separate events, related only by time and other physical projection features.

The instructional sequences thus include prereading instruction in both decoding skills (phonics, deciphering images in terms of

sounds) and interpretive skills (answering meaningful questions). The behavioral objectives of the program are to teach phonetic analysis and synthesis of letter combinations, more popularly labeled, "sounding out" skills. The important specifications of these objectives are:

1. Indicating Response: pointing to a letter (or pressing a letter button) in response to its sound.
2. Oral Sound Response: saying a letter sound in response to its image.
3. Unitary Response to Letter Combinations: after learning the individual sounds for m and o, seeing these two letters together in the form mo and behaving as if the combination is simply a new configuration with its own distinctive sound. This unitary oral response is an association of sound with symbol and forms the basis for higher-order blending skills in our program.
4. Blended Response to Letter Combinations: synthesizing two or more letters (or combinations), involving a left-to-right movement of the eyes in conjunction with a left-to-right vocalization of the sounds associated with the letters in the configuration. This requires vocalizing the sounds in an ordered fashion and mixing them to produce the blended sound.

Three sequence revisions have been evaluated by means of pre and posttest data for the indicating and oral sound responses to single letters. Mastery at the level of indicating responses generally was much easier to achieve than mastery at the level of oral sound responses. The successive revisions showed increasing effec-

tiveness in producing mastery of the oral response.

The behavioral and motivational techniques developed for the unitary oral sound response are applicable over a wide range of content. The skill of associating names or sound with symbols is obvious in such diverse areas as colors, numerals, body parts, musical notes, and a wide variety of objects.

Most recently, a program was tested which consisted of 62 seven-minute lessons designed to take a child from knowledge of single sounds to the phonic analysis and synthesis of phonetically regular three-letter words. These were divided into 34 machine lessons to be presented to each child working alone, and 28 tutorial lessons to be presented by a tutor using specially designed tutorial books containing specific audiovisual information to be presented to one child at a time. In addition to the 62 main sequence lessons, there were both machine and tutorial branching lessons based upon a differential practice structure in which children were assigned to specific branch lessons based upon a combination of which behaviors were both strong and weak in their repertoire. Approximately 18 machine lessons were specially designed as branches in which one skill was coupled with another skill. In this manner, children showing strength in one skill and weakness in another could be assigned to a specific lesson in which the strong skill was contrasted with the weak skill, thereby enabling the weaker skill to acquire additional strength through differential practice.

The amount of information dealt with in this sequence consists

of six single letters, six two-letter combinations, seven meaningful trigrams (three-letter words) and seven abstract (nonsense) trigrams.

The average pretest score for the kindergarten children on knowledge of letter sounds and trigrams was zero. This score also reflects an absence of letter-name knowledge. The average letter-sound score in the first grade pretest reflected some knowledge of letter sounds. The average first grade child knew one of the letter sounds prior to program exposure. These first graders also knew an average of one of the trigrams being taught.

As children have progressed through the first half of the program (lessons 1-34), approximately 60% are requiring little or no branching. The remaining 40% require a variety of branching, ranging from differential skill practice to special reinforcing techniques administered in tutorial settings.

Basic Research

Ours is essentially an applied research project. However, in the process of developing and testing lesson sequences, important issues related to basic research arise. Two such basic research issues were deemed important enough to design and conduct pilot studies.

Effects of two types of feedback on the acquisition of sound-symbol correspondence: the problem of the locked keyboard as a feedback mechanism

In several of our progress reports as well as other places we have discussed the problem of the locked-key mechanism as a limiting

feature of the Edison Responsive Environments Instrument (ERE). The problem, as we have presented it, is simply that the exclusive use of the locked-key as feedback for a sound-symbol indicating response produces inattention, random pressing behavior, and a resultant failure to acquire the sound-symbol indicating skill. We have found it necessary to "program around" this problem by training a pointing response which may be followed by positive corrective feedback in the form of a visual image of the structural mnemonic. This problem and its solution were mainly the result of careful observation rather than controlled experimental analysis.

A pilot study was designed to experimentally compare the behavior produced by locked-key feedback with that produced by positive verbal feedback. Negative locked-key feedback is the stimulus of the locked-key following an incorrect pressing response, which tells the child, "Not that one." Positive verbal feedback is a verbal stimulus following an incorrect pointing response, which has previously been demonstrated to control that response. It was hoped that, in addition to verifying our hypothesis regarding the superiority of positive feedback, the study would provide further insight into the acquisition of the sound-symbol skill and the role of positive corrective feedback.

Two groups of children in the Head Start Program received the same machine skill training on Day 1. On Day 2 and Day 3, one group received sound-symbol training (e.g., jingling bell-square) with only the locked-key as feedback for an incorrect response associated with that sound. Only the correct key will operate, so if the child

makes an error he finds the key locked and the machine waits for the child to depress the correct key before initiating the next trial. The other group also received sound-symbol training on Day 2 and Day 3, but verbal feedback was provided for an incorrect indicating response.

Comparison of the number of trials out of 60 on which the subject's first key selection was correct showed a statistically significant difference between the groups. The data clearly indicated that performance following positive corrective feedback is superior to that following negative feedback, at least for the case studied -- sound-symbol correspondence for small amounts of material. The results did not show, however, that learning does not occur following negative feedback, as evidenced by the apparently better-than-chance performance of two of the subjects who had received negative feedback.

The effect of motivation contexts on attention in younger learners

This pilot study explored the effects of motivational contexts on learner attention in a machine instructional setting. One purpose of the exploratory study was to verify the fact that the motivational techniques used in these sessions could significantly reduce irrelevant behavior for all subjects, resulting in increased attention to the audiovisual stimulus.

Eight sessions (1-8) requiring visual matching of three plain letter shapes by means of pointing comprised a minimal context. Eight additional sessions (9-16) required the same task of visually matching identical letter shapes, but involved a greater variety of

stimulus and response modes. Sessions 9-16 comprised the motivational context.

Subjects were five kindergarten children. Pretest knowledge of the task (visual matching) was 100% for each subject. A known task was purposely chosen to control any influence which a more unfamiliar task may have upon attention. Each session was five minutes (machine time), one session per day, given on successive days. All the lessons were administered by the ERE machine. Irrelevant behavior consisted in looking in mirrors, looking around booth away from machine, handling door or door knob, getting out of chair, handling machine parts unrelated to less (microphone, panels, lucite housing). Duration of irrelevant behavior was cumulatively recorded by means of stopwatch, with experimenter observing outside room through one-way mirrors.

The total time that each of five students engaged in irrelevant behavior was compared for minimal and motivational contexts, using an F test and a 2-way analysis of variance. A longer mean duration of irrelevant behavior was recorded for minimally treated sessions. The difference between treatments was significant at the .05 level. The effect of the motivational context was evident on all five children. Irrelevant behavior decreased rapidly during session nine, and continued a general decline for all students as the motivational sessions continued.

Institute for Developmental Studies
School of Education
New York University

Visual Discrimination of Alphabet Letters

Based on: Gotkin, L., and Caudle, Fairfid. "The Alphabet as a Sensori-Motor Experience." The Instructor, August, 1967.

Gotkin, L., and Caudle, Fairfid.* "Effects of Complexity in a Three-Dimensional Letter-Matching Task upon Two-Dimensional Letter-Matching of Nursery Children." 1965 (mimeo).

Gotkin, L., Caudle, Fairfid, Gans, Harriet, Saggese, Vivian and Schoenfeld, Linda. "Effects of Two Types of Feedback on Training and Posttest Performance in a Visual Discrimination Task." 1968 (mimeo).

In 1964 when this research began, the idea of systematic or formal instruction relating to the alphabet was anathema to the early childhood educational establishment. At that time, the underlying orientation of our work involved reducing alphabet symbols to sensori-motor experience. Since this was done using an alphabet form board with which four- and five-year-olds from disadvantaged backgrounds were introduced to the alphabet by handling wooden letters, the controversial content of our work was readily observable. A barometer for judging the extent of the controversy was the reaction of classroom teachers who were asked to use the form board on an experimental basis. Their initial reactions ranged from war-

iness to overt hostility.

The studies reported herein refer not to classroom applications but to controlled studies. These studies made use of perceptual tasks related to beginning reading. The studies are based on a conception of learning to read as a complex task. Merely learning the forms of the letters of the alphabet is understood to entail the coordination of several behaviors: initial perception of the forms, attention to the differentiating characteristics of particular letters until recognition of the letters is achieved, and finally, the naming of letters.

These studies were concerned with question of how the child might best be helped in the initial stages of his learning by the task materials provided for his training and by the information given him about how well he is doing, as he proceeds in the task. In more technical language, visual discrimination of letters and letter-like forms was examined as a function of: 1) stimulus characteristics, i.e., task complexity (number of forms) and stimulus "richness" (two-dimensional forms, tapping only vision, vs. three-dimensional, providing for use of more than one sense modality; and 2) feedback, i.e., sensori-motor, visual, and/or verbal.

At the outset, letters forms were introduced as a sensori-motor experience, rather than as an abstract symbolic system, by means of an alphabet letter form board. In some ways, the alphabet board is similar to a puzzle. The puzzle pieces consist of wooden letters, and the child places these wooden letters into individual letter-shaped slots. The wooden letters are three inches high, and each

letter slot can contain two identical letters, placed one on top of the other. The surface of the alphabet board measures 19 x 27 inches, and, when in use, it is propped up at an angle.

The major impetus for the design and development of the alphabet board was the work of the Swiss psychologist, Jean Piaget. In his many studies of the ways in which children develop, and of the stages through which children pass as their perceptual and cognitive abilities expand and become capable of more and more complex ways of thinking, Piaget has repeatedly emphasized the great importance of sensori-motor activity, and particularly the importance of visual and tactile exploratory movements. Furthermore, Piaget has emphasized the importance of the very early years of the child, before school age, in providing the foundation of later cognitive development. In designing the alphabet board for four- and five-year-old children, it was felt that the type of experience which could be provided by the alphabet board would serve to familiarize a child with the shapes of alphabet letters, without requiring the child to cope simultaneously with sounds of letters. Furthermore, this familiarization could occur at an earlier age than is possible in formal reading instruction. Later on, when formal reading instruction was begun, presumably a child who has mastered the perceptual problems of visual discrimination using three-dimensional solid letters would find it easier to do the same thing when the letters were printed in two-dimensional form.

A second reason for giving early experience with solid letters, rather than with two-dimensional letters, is that solid letters used

in a manipulative task provide the child with a richer experience than that which can be had with two-dimensional letters. By a "richer" experience is meant an experience in which the child can make use of more than one sense modality, touch as well as vision.

A third reason for the design of the alphabet board as a task in which letters, in addition to merely being handled, are placed inside letter-shaped slots, is that such a task automatically provides the child with corrective feedback, that is, with information about the correctness of his actions. With very few exceptions, each letter can be placed only in its own letter slot, and only when the letter is oriented correctly. It was anticipated that this corrective feature of the alphabet board would help the child to learn to pay attention to the details of shape which differentiate letters of the alphabet, such as the "tail" of the Q, and the lack of one with the "O". To be sure, there are particular letters with which this type of differentiation is much more difficult, such as the rather insignificant differences in the shapes of "M" and "W", and for letters such as these, tasks using the alphabet board are better structured so that the emphasis is on orientation rather than shape.

I. Exploratory Studies Varying Conditions for Use of Letter Form Board

The initial study focused on evaluating the letter form board through observation and recording of the behavior of nine pairs of children at the kindergarten level in interaction with the board,

with minimal instruction and no correction of errors on the part of the observer. Pairs of children completing the "puzzle" together were observed because we wondered whether a child who knew the names of some of the letters would spontaneously try to teach these to a child who did not know them.

The children were grouped to form nine pairs on the basis of compatibility and four levels of familiarity with the letter names. Each pair of children was given four sessions with the board, each lasting about 15 minutes and with the letters piled in random order and orientation.

The existence of certain perceptual difficulties became apparent in the play of letter-naive children with the board. It was common for such children to pick up the "B", for example, and to attempt to force it into the "B" slot in a reversed position, a graphic demonstration of a reversal error. Another type of error which illustrates perceptual problems occurred when the child would take an "O" and attempt to put it into the "D" slot. In the beginning, the children sometimes seemed to feel that if they pushed hard enough, they could make the letter conform to the shape of the slot, which suggests that the children were trying to solve the problem in a primitive way and were not making use of the relevant visual and tactile feedback. The relevance of instruction became apparent when, with increased experience, children began to scan the board visually and were able to select the correct slot immediately, thereby relinquishing the more primitive trial and error behaviors.

The behaviors of the children as they attempted to complete the

task may be described in terms of four operational levels. These levels do not represent discrete patterns in which all letters are manipulated in the same way. Rather, each level includes a range of behaviors which altogether indicate a general level of sophistication. The levels have been designated:

1. Trial and Error: this level is characterized by attempts to force letters into inappropriate slots;

2. Comparison: this level is characterized by a matching procedure during which the child consciously searches for forms similar to the letters, while holding the letters in front of him as guides;

3. Scanning: this level of behavior is characterized by the child's visually scanning the board without holding up the letters as guides;

4. Mapping: when the child has achieved this level, he not only knows the correct orientations of the letters, but he also knows almost exactly where their slots are located in the board. (Only a few children gave evidence of developing a map of the entire board.)

On the question of pairing, we found that a child who knew letters sometimes would name the letters aloud, or point them out to the other child, but this was quite rare. Furthermore, the child who could name letters was also faster at discriminating and placing them, and would place many more letters than his less knowledgeable partner.

In effect, the letter-naive partner was provided with a model

for imitative learning, but his opportunity for direct confrontation of the task requirements was reduced. To explore the effects of this reduced opportunity for active practice on the letter-naive subjects, a few letter-naive children, who had seemed to be learning as they worked with partners, were allowed to complete the board by themselves. In several instances, these children appeared to have learned very little from their previous experience, for they again worked at the level of trial and error and seemed to find the task quite difficult. Thus, pairing of letter-naive children with more advanced partners proved not to be as effective a strategy for the use of the letter form board as we had postulated.

Observations throughout the exploratory studies suggested that the size of the task, i.e., sheer number of letters to be placed, was an important variable in determining the way in which the children dealt with the task. It was observed that errors were more frequent in the beginning of the session, when there were more empty letter slots, rather than toward the end of the session, when there were only a few remaining possibilities. These observations led to the decision to determine what happened when the number of letters was reduced from all 26 to five letters. Three new subjects were given informal sessions in which the task involved only five letters; the remaining letters were already in their slots.

There was a marked difference between the behavior of these children and the behavior of those children who had had previous experiences with partners and were then allowed to complete the entire board alone. The children who were given the smaller task

exhibited scanning behavior almost from the beginning and made very few errors. There were exceptions, since position errors characteristic of the trial and error phase occasionally were made; however, other errors were extremely rare.

II. Effects of Task Complexity

Subsequently, a more formal study was undertaken to assess the effect of task complexity on the children's ability to deal with the letter form board. An additional aim of this study was to determine whether training with solid letters would improve the children's ability to match two-dimensional letters.

A two-dimensional letter-matching task was used as a pretest to select subjects and as a posttest to compare experimental and control groups with regard to improvement resulting from intervening training with three-dimensional letters. Only those children were chosen who made a minimum of four errors in the pretest in matching each of ten letters against an array of 26 letters. The task also required the matching of each of ten letters against a nine-letter array. Three groups of six lower SES, Negro nursery school children were then exposed to the following training procedures in a series of five-trial sessions:

1. Non-Gradual Training: on each of the five training trials, the children were given, one by one, the 26 different letters to place in the letter form board. This constituted the more complex task.

2. Gradual Training: these children also made 26 placements

letters in each training trial; however, the placements were distributed among only six different letters during the first trial, 13 in the second, 19 in the third, and 26 in the fourth and fifth trials. This constituted the less complex task.

3. No Training: a control group, receiving only pretest and posttest, with no exposure to the letter form board.

The major results were as follows:

During Training, children given Non-Gradual Training (the more complex task) required more time and more assistance from the experimenter. However, this additional time and assistance was significantly different between the Gradual and Non-Gradual Training groups on only the first two of the five sessions. Nonetheless, it is noteworthy that on the first training trial, the six children in the Non-Gradual Training group required a total of 25 assists from the experimenter. Assistance was given by the experimenter only after a child had spent a minute unsuccessfully attempting to place a letter. If the assistance provided by the experimenter had not been available, it is doubtful that the children requiring so much help would have persisted to completion of the task.

For the Gradual Training group, the only increase in assistance required occurred in the second trial, and thereafter a decrease, although new letters were still being introduced. This would appear to indicate that certain skills learned in previous training periods transferred to the child's manipulation of new letter shapes. Perhaps in the initial sessions for the Gradual Training group, the children were learning the "rules of the game"

without the concurrent necessity of coping with a large number of choices. In contrast, the children who received Non-Gradual Training had to learn the "rules of the game" in a much more difficult and frustrating situation.

On the Pre-Posttest Comparison, both the Non-Gradual and Gradual Training groups improved significantly over the control group in matching two-dimensional letters. Thus, there appears to have been some transfer from the three-dimensional task to the two-dimensional task.

Analysis of the errors made in the 26-choice pre- and post-tests revealed a position effect in that the majority of incorrect letters chosen were in the lower left portion of the board. This position effect suggests that a large number of choices might have the effect of discouraging the child from looking at all letters in order to find the correct one.

In terms of task complexity, there was no significant difference between the Non-Gradual and Gradual Training groups in improvement from pretest to posttest.

III. Effects of Feedback

This study explored feedback as a variable. In the studies summarized above, which used the letter form board, feedback was "automatic" and "detailed," since a letter could be placed in only one position in only one slot (with few exceptions). In this study, the board was not used. However, "automatic" feedback was provided for some subjects in the form of verbal confirmation, while feed-

back merely was made available for other subjects within visual materials used.

In addition, a pseudo-alphabet was developed to eliminate the effect of differences in knowledge of the alphabet that might exist among the children used as subjects. The "pseudo-alphabet" is a set of 16 letter-like shapes. Each shape consists of a vertical line with a semi-circle connected in one of four possible positions to the top, and with one of four possible straight line patterns on the bottom. The pseudo-alphabet provides for more systematic stimulus variation than does the real alphabet, while reducing the effect of differences in knowledge of the alphabet that might exist among the children used as subjects.

The stimulus materials used in the task were cardboard (opaque) or plastic (transparent) cards with the letter-like forms printed on them. The child was required to match the stimulus materials to a matrix of the pseudo-alphabet forms. The stimulus properties of the transparent cards make available a prompt in that they reveal the correctness or incorrectness of the response when overlaid on the matrix. During the training period, there was opportunity for the subject to change his responses, utilizing the prompts in the material.

The experimenter feedback was a verbal confirmation (yes-no) of the subject's response to the task, given after the subject had made his final choice. In addition to this verbal feedback, in two groups, the experimenter also pointed out the location of the subject's error when one was made. The pointing was considered addi-

tional experimenter feedback to the verbal confirmation.

On the basis of a pretest in which children had to match 16 pseudo-alphabet forms on a solid test card held up by the experimenter to the same form on the matrix board, 70 children (low SES Negro, kindergarten age) were chosen as subjects. These children were divided into six experimental groups and one control group. The experimental groups then underwent three days of training before taking the posttest on the fourth day, along with the control group. Each group underwent one of the following kinds of training:

1. Placement of a transparent test card containing the stimulus form over the matching form on the matrix.
2. Match of solid test card to matrix.
3. Verbal confirmation of experimenter, along with matching of transparent test cards.
4. Verbal confirmation of experimenter, along with matching of solid test cards.
5. Pointing out location of subject's error, along with verbal confirmation and transparent cards.
6. Pointing out location of subject's error, along with verbal confirmation and solid cards.
7. Control group: comparison of forms on solid cards. The forms for this group were simple pictures, rather than the pseudo-alphabet forms used with the experimental groups.

The results of this third study may be summarized as follows:

During training, there were significant effects due to verbal feedback from the experimenter and due to transparent materials

having feedback properties. The effectiveness of the feedback from the transparent cards was contingent on the verbal confirmation as to the correctness of the response.

On the pre-posttest comparison, training using either transparent or opaque cards as feedback materials, without "Yes-No" type of feedback, did not produce more learning than did training with a simple matching task using different materials (Control Group).

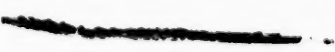
The superior performance due to use of the transparent cards during training was not maintained for the posttest.

The only variable which produced superior posttest performance was the verbal feedback providing for knowledge of the correctness of response.

The most powerful finding of this study involves the effectiveness of feedback from the experimenter. Both in training and posttest performance, groups receiving experimenter feedback were superior.

This finding emphasizes the importance of the external confirmation of the correctness of response in this type of task for this type of population. It was our belief that the perceptual feedback, or prompting cues, available in the transparent materials would gradually be used by the children without external help. This did not prove to be the case. On the other hand, the perceptual information available in the transparencies was utilized and utilized quickly once the children had been provided with feedback from the experimenter.

The pseudo-alphabet shapes were constructed from variations of



semi-circles at the top and straight lines at the bottom, as described earlier. Therefore, it was possible for the children to make two types of error: one, in which the mismatch occurred for both the top and bottom portions of the pseudo-alphabet shapes, and the other, in which the mismatch occurred either for the top or bottom portion alone. In the latter instance, the subject is half right.

The pretests revealed that more than 75% of the children's errors were of the "half right" variety. For this reason we felt that feedback in the form of the experimenter's pointing to the one critical portion would be effective in helping the subject improve his performance.

In training, the information made available in the materials (transparencies) was used once the children had been taught to use it. On the other hand, the information provided by pointing was not used. Two explanations seem plausible. One, the information provided by the pointing was redundant. That is, the verbal confirmation part of experimenter feedback provided enough information for the children to figure out the source of their error. This is partially borne out by the high performance of most of the children in all conditions in which the experimenter gave feedback. The other explanation is that while the pointing feedback seemed to be a clear way of focusing the children's attention to the critical dimension, it was not explained to them that the experimenter was pointing to the location of the specific error. Perhaps pointing would be more effective if its implications were stated more ex-

plicitly to the children.

The posttest task differed from the training task in that subjects no longer had the stimulus items in their hands and the experimenter-feedback and materials-feedback variables were eliminated. Posttest performance required looking at the stimulus item and pointing to the symbol that was the same on the response board. The results indicate that only for the groups trained with both transparent cards and experimenter feedback was the error decrement from training performance to posttest performance significant. This suggests that the superiority of these groups was prompted by the information available in the transparencies and that the children were dependent upon this prompt.

In summary, this series of studies indicates that four- and five-year-olds from disadvantaged backgrounds are ready to cope with perceptual problems involved in discrimination of letters and letter-like forms. They further reveal that the effectiveness of materials and tasks designed to provide experiences with such symbols ought to: (1) match the complexity of the task or materials with the ability of the child to process the visual information; (2) provide feedback that the learner does recognize and can use.

The importance of matching task complexity to children's ability is made very clear in the observation of the study on task complexity that, without assistance, it is likely that some of the children would never have completed the task.

The importance of extrinsic feedback is suggested by observa-

tions during the exploratory studies that a primitive Trial and Error stage preceded some children's attempts to use the visual and tactile feedback available in the letter form board. Furthermore, in the study of feedback variables, the subjects did not make use of the available visual feedback until external reasons were provided. In addition, they did not give up their use of the prompts available in the transparencies. These subjects approached this task in a passive fashion. Only one of the thirty subjects using transparencies gave overt evidence of an active learning style, making comments like, "That's not it," as she rejected half-right answers. In contrast, four middle-class children, who were given the experimental materials in order to explore this question of learning style, all gave some evidence in their verbal comments of an active learning style.

What was revealed about task complexity and feedback variables in this series of studies may be less important in itself than related insights about the interrelation of task complexity and the learning style of the subjects. Many enrichment programs for young children from disadvantaged backgrounds emphasize that children learn from their free play with materials. Children are to be provided with an enriched environment and be free to encounter that environment with minimum adult intervention, and from this encounter they will learn. The studies reported here suggest that the specific learnings which grow out of the free play of these children do not prepare them to cope with tasks of ever-increasing complexity. The disadvantaged children of these studies displayed

an active learning style in relatively simple tasks; responsive adult intervention may be desirable to support in these children an active learning style in confronting more complex tasks.

Institute for Developmental Studies
School of Education
New York University

Preschool Observational Scales

Based on: Wilensky, H. "Observational Techniques in Preschool Classrooms," 1966. (mimeo)*

At the Institute for Developmental Studies, a number of observation scales have been developed for use in the classroom. These scales make possible both feedback to individual teachers, and more concrete specification of effective teaching behaviors.

To date, the work done on the teacher and pupil observational scales has consisted mainly in the development and refinement of the scales, with some collection of the descriptive data which ultimately will permit assessment of the effect of systematic variation of curricular elements. Data collected so far by means of the observation scales have helped us to evaluate procedures in terms of the extent to which theoretical principles and stated educational objectives were being implemented in the classroom and the extent to which the enrichment program was being replicated within the project classes. Preliminary attempts have been made to utilize the scales to determine which teacher-pupil behaviors contribute to the enhancement of cognitive skills in children. The scales have been used for observation of children at the prekindergarten

*The scales described in this report are included in the Appendix, pp. 153-157.

level, kindergarten, and first and second grades.

Copies of the scales are included in the Appendix.

1. The Time Distribution Record (TDR) provides a gross description of the enrichment program by means of a systematic record of daily classroom activities. Specific activities are summarized in the basic categories of "child-centered activities," "teacher-centered activities," and "routines and snack time." Child-centered activities are those in which the children function with relative independence in directing their individual projects. Teacher-centered activities differ in that the teacher is the focus of attention of the whole group of children (i.e., more than half of the children are in the group being addressed by the teacher). "Routines" refers to any time taken up by the class, not an individual, in making a transition from one activity to another, including snack time when it is not accompanied by a lesson, etc. Categories of "miscellaneous" (any unusual activities such as a fire-drill) and "unfilled time" (late starts or early dismissals) also have been included in the scale).

Ratings of five Institute classes on the Time Distribution Record showed that, despite attempts to standardize and duplicate the curriculum in all classes, there was considerable variability among classes in the time spent in various activities. The differences appeared to be attributable to teacher idiosyncrasies and characteristics of the physical facilities. In general, observations based on the scales strikingly reveal the difficulty of attempting to translate teaching principles into practice. It would

appear that much more rigid supervision would be need the "enforce" systematization of curriculum among classes.

2. The Location Activity Material Inventory (LAMI), provides an objective description of child behavior during the Play Period. The dimensions selected for study include the child's geographic location in the classroom, the equipment he is using his social contacts, and the type and intensity of his motor activity. Ratings of four Institute classes on the LAMI have suggested directions for curriculum development. The findings also demonstrated certain deficiencies in the execution of the program objectives. Though the remedial and tutorial aspects of the play period have been emphasized to teachers, it appeared in three of the four classes that the brighter children were more often interacting with the teacher. In addition, educational material such as books, taped stories, and the specially constructed "alphabet board" received little use.

Relationships between activity and intellectual ability and social interaction were examined; they were found to be at chance levels.

3. The Teacher Play Period Rating (TPPR) complements the LAMI observations on the children with ratings of teachers' behavior during the play period. This scale classifies child-teacher interactions in terms of five categories: "informal teaching," "auxiliary help," "control," "direction," and "social or role play." The outstanding finding at this stage of analysis is the relatively small proportion of the teachers' time devoted to informal teaching, despite the emphasis on opportunity for tutorial contacts during this period.

4. The Teacher Observation Scale (TOS) measures four dimensions of teacher style which have been hypothesized as important in mediating classroom learning. Three of the dimensions deal directly with the implementation of learning: "information giving," "eliciting responses," and "feedback to the child." The fourth category, "control," is concerned with the amount of disciplinary behavior. The data gathered by means of the TOS revealed that the teachers spent a major portion of their time "giving information" in comparison to other behaviors. In addition, there was variation among the teachers in how their behavior was distributed among the observational categories. The sizable and significant differences in the teaching styles of the four teachers suggest that the investigation of the relationship between the various categories and pupil achievement may prove fruitful. The available data, such as the various ability tests administered at the end of the year, do not reveal differences related to TOS, but more precise and specific measures of achievement may identify some effects of the observed differences in type of lesson and teacher style.

Regarding the experimental program, the TOS data did reflect the effect of previous experience in the program. The teachers who had been in the program during the prior year offered more non-story lessons and engaged in more "eliciting responses" behavior.

5. The Child Attention Rating Scale (CARS) is a simple behavior checklist for observations of children's behavior during group lessons. The behavior to be rated consists of the visual, verbal, and motor (manipulation and locomotion) behavior of the child. Data collected by means of this scale has not yet been analyzed.

Institute for Developmental Studies
School of Education
New York University

Auditory Training for Retarded Readers

Abstract of: Feldmann, Shirley C. and Deutsch, Cynthia P. "A Study of the Effectiveness of Training for Retarded Readers in the Auditory Perceptual Skills Underlying Reading."*

The relationship of auditory perceptual skills to reading has been shown in previous studies. Studies also suggest that auditory skills are developmental and that their relationship with reading may be differential with age, being strongest in the early school years. There was some evidence to suggest that immature auditory perceptual skills might be associated with reading retardation in young children, especially in socially disadvantaged groups where early home experiences might not have fostered development of auditory skills.

The present study investigated the relationships of auditory and reading skills in the young retarded reader, with the aim of ameliorating auditory deficiencies in order to effect modification of reading learning. It was hypothesized that a developmental program of auditory skills for socially disadvantaged young retarded readers would facilitate their reading relearning, both immediately after the conclusion of the program and after a year's time.

Two studies were undertaken. In the first study, three treat-

*Final Report to the Department of Health, Education, and Welfare, 1966. Principal Investigators: Shirley Feldmann and Cynthia P. Deutsch.

The complete report is available from
EDRS (ED 013 749); MF-\$0.75, HC-\$9.20-182p.

ment groups were organized to receive varying combinations of auditory and reading training: reading only, auditory only, and successive reading and auditory training. For the single-treatment groups, the children had a play period as well, so that time spent with the adult tutor was constant across experimental groups. There was also a control (no-treatment) group. Sixty-four third-grade reading retardates from socially disadvantaged backgrounds were randomly assigned to one of the experimental groups or to the control group. In the second study the treatment groups were: reading only, successive reading and auditory treatment, and combined reading and auditory treatment. In Study II there were thirty-four retarded readers from socially disadvantaged backgrounds. Subjects were randomly assigned to the treatment and control groups.

In both studies the children were taught in groups of three or four for about a five-month period. The auditory curriculum and auditory tests were constructed for the studies.

Batteries of individual auditory and reading tests were given before and after the treatment periods. In Study I the tests were also given six months and one year after the treatment period ended to ascertain any long-term gains in reading skills.

The results of Studies I and II did not support the hypothesis that a developmental auditory program would facilitate reading re-training for young retarded readers. There was no evidence that any one treatment group was superior to the other, or to the control group, in effecting improvement in reading. Some of the treatment groups did show significantly higher scores from the first post-

treatment evaluation to the other post-treatment periods.

Error analyses of test means, as well as tutor evaluations of pupils' learning of specific skills tended to support the findings that although some skill improvement had been shown after treatment, it was slight and was not differentiated among the treatment groups.

There were some significant tutor-by-treatment and ethnic group-by-treatment effects for some of the auditory and reading tests. Qualitative evaluations of pupil personality and learning characteristics showed that some of these appeared to hinder reading learning. Such findings suggested that there may be complex interrelationships of teacher and pupil variables with reading learning, which may in part account for the inconclusive results of the study.

In evaluating the program, the appropriateness of the auditory curriculum was questioned, especially in regard to its developmental sequence for third-grade retarded readers. It was judged that more teaching for transfer of auditory skills to reading was needed.

Institute for Developmental Studies
School of Education
New York University

Self Concept Study

Based on: Brown, B. "The Assessment of Self Concept Among Four-Year-Old, Negro and White Children: A Comparative Study Using the Brown-IDS Self Concept Referents Test"*

This study describes a technique designed to assess some dimensions of self concept held by 4-year-old children and reports the results of a pilot study using this technique. The measurement referred to is the Brown-IDS Self Concept Referents Test** which operationalizes G.H. Mead's self-awareness theory. The test is based on the assumption that the child's self concept is formed not only through his own perception of himself ("self as subject") but also through the way others perceive him ("self as object"). These "others" include the child's mother, the child's teacher, and the child's peers.

The test was administered twice to 38 four-year-old lower-SES Negro and 36 upper-middle-SES white children at a three-week interval to determine the reliability of the measure.

The procedure was to present each child with a Polaroid photo

*A shorter version of this paper was presented at the Eastern Psychological Association Meetings, New York City, April, 1966.

** The Brown-IDS Self Concept Referents Test is included in the Appendix, p. 158.

of himself and ask him to describe himself on 14 descriptive dimensions (e.g., happy-sad; clean-dirty; strong-weak; etc.) from the four perspectives noted above (how he sees himself; how his mother sees him; his teacher; his peers).

The following major results were obtained from this pilot study:

- 1) The test-retest reliability was relatively high over the three-week interval.
- 2) Negro children scored significantly lower than white children on both the "self as subject" and "self as object" measures. They tended to see themselves and be perceived by their teachers as sad rather than happy, sickly rather than healthy, frightened of people and things, etc. more frequently than the white children. However, both Negro and white children held high positive perceptions of how they were regarded by their mothers and their peers.

The technique outlined in this paper and the results of the pilot study indicate, with acceptable reliability, some specific dimensions on which differences in self concept occur between Negro and white children. However, these differences between the Negro and white children were confounded by the disparity in SES level and further study is necessary in which this variable is held constant.

Institute for Developmental Studies
School of Education
New York University

Classroom Integration

Based on: Brown, B., Millman, Susan, Hemenway, Marian, Morrissey, Hatice, and Whelan, Janet. "Operation Integration: A Study of Social Interaction in Racially Mixed Classrooms," 1967, (mimeo).

In recent planning to improve public education it has commonly been assumed that quality education is a likely result of "desegregation." From the perspective of presently available knowledge about the dynamics of social interaction, however, there is much to suggest that occupying the same physical space may not, in and of itself, lead to the formation of positive social relationships. Although proximity does lead to an increase in the frequency of interaction, it is also apparent that situational factors strongly affect the quality and durability of interpersonal relationships which form in a given social context.

Because educational planning required an understanding of the implications of "desegregation" and of various techniques to achieve this end, a study was undertaken at the Institute which included attempts to:

1. observe patterns of interaction of white and Negro children in a classroom setting under a variety of conditions;

2. assess the influence of racial awareness and in-group preferences on interaction patterns, both child-child and teacher-child, in the integrated classroom;

3. compare the self-concepts of Negro and white children;

4. assess the effect of positive interaction with white classmates on the intelligence test scores and self-concepts of Negro children;

5. evaluate the effectiveness of specific intervention procedures (namely, instructions to the children to work together or to work alone on a series of tasks) in facilitating racial mixture.

During the school years 1965-66 and 1966-67, 96 children of lower SES were observed in fourteen classes balanced for race and sex.

Systematic observations of children's interaction patterns were conducted during classroom free-play periods. This occasion was selected because children were maximally free to: 1) seek interaction with all other children in the class, and 2) choose their own materials or activity. Observations of both verbal and non-verbal behavior were made by a team of three independent observers. Behavioral coding categories included: facilitative, inhibitory, aggressive, and "other" classifications.

"Pick-a-partner" exercises were used as behavioral sociometric measures of partner preferences between children of similar and dissimilar race and sex. Teachers asked all children to pick a partner for one of several activities, and observers outside the classrooms recorded the composition of resulting pairs. For pur-

poses of data analysis, observations were made only on those days when each child was assured a chance of picking a partner with characteristics similar to his own or dissimilar. Sociometric preference also was determined by requiring each child to identify his "four favorite playmates" from a series of standard (individual) photographs of all other children in his class. From these four pictures, each child then selected his two preferred classmates. Finally, the single, most preferred playmate was selected from these two.

Teacher-child interaction was observed during snack-time periods in each classroom. The teachers were instructed not to use this time for direct teaching activities. Their responses to children's initiating activities were coded by three independent observers. An important feature of the teacher-child observation procedure was that teacher response styles were recorded as a joint function of teachers' behavior and children's initiations. Race and sex differences in children's initiating behavior thus were studied, as well as the differential responses made by teachers to children whose social characteristics were like or unlike their own. There were four teams of licensed teacher and assistant teacher: two Negro teams, and two white. Categories of children's initiating activities included: snack routines, information-seeking or -giving, attention-getting, and bizarre (irrelevant) behavior. Teacher response categories were: non-acknowledgement, minimal acknowledgement, facilitative acknowledgement, and inhibitory acknowledgement.

The Brown-IDS Self Concept Referents Test (1966)* was used to

*This test is included in the Appendix, p. 158.

assess differences between Negro and white children in self and social perceptions. The test requires a child to adopt the perspective of several significant referents -- mother, teacher, and peers -- toward himself and to report their estimated perceptions of him. In addition, he must report his own perceptions of self. In addition to determining the extent of differences between Negro and white children on these measures, the test was used to study: 1) the relationship between self concept and I.Q. scores; 2) children's perceptions of their teachers' perceptions of them as a function of same or different racial characteristics of their teachers; and 3) the relationship of self concept to racial awareness.

A procedure was developed to determine the level of awareness of racial differences among Negro and white children. The Race Awareness Test provides information on two separate dimensions, degree of awareness (high as opposed to low) and quality of awareness (egalitarian as opposed to in-group preferences). Children are required to choose one of four dolls (e.g., female white, male Negro) in response to each of several questions. A typical question is, "Point to the one who you would like to play with most." The final section of the test requires simple identification of a Negro and white doll by the child, and selection of the doll which is most like himself.

Finally, several group problem-solving intervention procedures (collaborative-effort vs. individual-effort) were developed and pilot tested in an attempt to discover methods of inducing facilitative interaction among Negro and white children. The basic obser-

vational data included frequency of interaction, i.e., the number of times children spoke to and responded to those of similar and dissimilar racial and sexual characteristics.

Data collection has been completed; some data analysis is still in process, specifically, analysis of teacher-child interaction data and the interrelationships between self concept, race awareness and classroom social interaction.

Observations of the children's interaction patterns showed little aggressive behavior. Negro children attracted the most interaction, both facilitative and inhibitory, from both Negro and white others.

The behavioral sociometric data showed that the children tended to seek interaction most frequently with others like themselves, with this tendency more pronounced for males than females, and especially apparent among white males. However, while white males most frequently sought interaction with other white males, Negro males sought interaction more frequently with white males, rather than Negro males.

With respect to self concept, there were few significant differences between Negro and white children with SES held constant. In comparison with the white children, Negro children, on the average, reported that they thought both peers and teachers perceived them in less positive ways. White children, especially girls, tended to see themselves as being evaluated more favorably by their teachers, (especially white teachers) than Negro children (especially Negro girls with Negro female teachers). For both white

and Negro children, the more favorably they evaluated themselves and saw their teachers as seeing them, the higher their I.Q. scores were likely to be.

On the Race Awareness Test, Negro children tended to misidentify themselves as white significantly more often than whites misidentified themselves as Negro. The results here were consistent with the behavioral sociometric preference data. White children expressed ingroup preference, but the Negro children, especially boys, tended to be less positive toward their own group (black doll) than to the white.

Institute for Developmental Studies
School of Education
New York University

Language Development in Preschool Children

Abstract of: "Development of a Standardized Telephone Interview
for the Measurement of Language Changes in
Young Children"* (mimeo)

The problem of obtaining representative speech samples from young children has been a major obstacle in the study of children's verbal behavior. This problem is especially crucial to the study of disadvantaged children, who have been found to be particularly weak in the area of language development and who display a high proportion of reading and learning disabilities.

In an exploratory effort to solve this problem, Institute personnel devised and piloted the Telephone Interview, consisting of six questions of a general nature which were designed to allow as much freedom of verbalization as possible within the structure of an interview situation (see Appendix)** During the interview, the child and the examiner sat in small telephone booths, 15 feet apart and facing away from one another. The questions were asked and answered over regular telephone instruments and the entire interview was taped.

*Final Report to the Department of Health, Education, and Welfare, May 1968. Project Director: Martin Deutsch.

**p. 163.

This technique, used with kindergarten children during their free play periods in their classrooms, proved to be effective both in obtaining children's speech samples and in discriminating between the groups of kindergarten children tested, in terms of imaginative use of language, the functional use of language, and the structure of the children's responses. In all instances, the experimental children who were enrolled in the Institute's enrichment program performed significantly better than their non-Institute controls.

The current study then was undertaken to meet several objectives:

- a) to develop a method for intensive analysis of transcriptions of the interviews so that changes in the language of children can be studied in terms of vocabulary level, language structure, and articulation.
- b) to determine whether the samples of speech obtained with the telephone interview are reliable.
- c) to determine whether the technique can be used in a longitudinal study to monitor change in verbal behavior of preschool children.
- d) to evaluate the effect of exposure to working telephones in the preschool classroom upon the child's performance in the telephone interview.

An additional future objective is to apply the findings of this study to a full-scale investigation of language development in children.

The subjects of the study were 25 lower SES children from five Institute preschool classes. The sample was divided into two groups; one group exposed to the working telephone for eight months, and the other having five months of exposure. Both groups received an ini-

tial or "pretest" interview followed by a second interview and a final or "posttest" interview. The former group had two informal interviews with their teachers between testings; the latter group had one such interview. In addition, there was a control group of eight children from a Board of Education preschool class; these children had no exposure to the working telephone, beyond an initial and final interview about six months apart.

The recorded interviews were used to develop a method of language analysis utilizing a total of ten measures (Appendix)*; I.Q. also was ascertained, by means of the Stanford-Binet Intelligence Scale.

This study has been partially successful with respect to three of its four objectives. There was evidence of systematic change in the direction of improvement over time, offering strong support for the usefulness of the Telephone Interview in a longitudinal study (Objective c). Further, the systematic change found could be expected only if the samples of speech obtained with the Telephone Interview, as revised, are reliable (Objective b), and the method of analysis has some validity (Objective a). Of course, the method of analysis was developed largely on the basis of the data obtained from the single sample of this study. It must be tested further on additional samples.

With respect to the fourth objective of the study, to evaluate the effect of exposure to telephones in the preschool classroom upon the child's performance in the telephone interview, it is somewhat difficult to draw conclusions. No significant differences were

*p. 164.

found in any comparison of the three groups with each other, suggesting that those children exposed to the telephone apparatus were not strongly or specifically influenced by it. Two points should be made here.

First, the design of the study was not geared to maximize the potential effect of the telephone apparatus. Rather, "exposure" to the telephone was essentially unstructured; the group with the greatest amount of exposure had only two teacher-directed uses of the apparatus between testings. Further, the difference in amount of exposure to the apparatus was not great. It would be helpful in future studies of the technique to increase the amount and vary the kinds of structured use of the apparatus, and also to record actual patterns of spontaneous telephone use by the children.

The second point that should be made is that the children of the three groups included in this study could be expected to be very similar to each other. In a previous study, analysis of telephone interview data by less refined measures than those used here did yield significant differences on a single testing between a group of children participating in the IDS enrichment program and a control group without pre-kindergarten experience. In the present study, comparison of subject groups on initial scores yielded no significant differences. Further, the two programs (IDS and Board of Education preschool) in which the children were participating probably placed comparable stress on linguistic development.

Slightly differing patterns of speech development were found in the groups over time in this study; the differences probably reflect classroom and curriculum emphases, rather than any single specific factor, such as exposure to the telephone.

Institute for Developmental Studies
School of Education
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Early Childhood Inventories

Based on: Coller, A.R., Victor, J., and Goldstein, L.S. "Early Childhood Inventories Project: Packet One." (mimeo)

Most of the available standardized tests of achievement developed for use with young children have been designed specifically to differentiate between individual children. As a result, standardized tests can rarely be used effectively to evaluate the impact of a particular educational program. The global measures yielded by such tests seldom indicate how well a child fared on each of the abilities tested. Even when subtest scores can be calculated, as in multiple-aptitude batteries, one finds that the item pool is not practical enough for reliable assessment of a specific area of behavior. In general, the standardized achievement tests currently available are neither broad enough nor detailed enough to evaluate adequately the effects of a particular curriculum.

Psychologists and educators have come to realize that such tests cannot fulfill many of the current needs for assessment. These tests are particularly limited for use as diagnostic instruments. It is felt that emphasis should now be placed on constructing multiple purpose instruments which would provide a more complete

picture of the child's ability across a wide spectrum of behavior. A "library" of such specially constructed inventories can be used to develop a profile of the child's strengths and weaknesses, thereby providing information of obvious diagnostic value. Such inventories can be especially useful for evaluating the effects of educational programs.

The Early Childhood Inventories Project (ECIP) was initiated at the Institute for Developmental Studies for the purpose of developing original aptitude/achievement-type inventories which could be used to assess specific behaviors of young children. As such, the project is an extremely ambitious one, having a variety of purposes: 1) the evaluation and comparison of educational programs, such as the Institute's enrichment program, Head Start programs, etc.; 2) the evaluation and comparison of conventional and/or experimental curricula; 3) the establishment of curricula based upon an assessment of group abilities and disabilities; 4) the determination of individual differences which could have immediate diagnostic and predictive value for the teacher; 5) the determination of the "readiness" of the child to proceed to the next learning step in a sequence; and 6) the evaluation of teacher effectiveness.

The behaviors to be measured by the ECI emphasize cognitive-type skills, but also include those aspects of social interaction and personality that are relevant for school success. Eventually, a vast "library" of inventories will be available and the curriculum evaluator, teacher, or researcher can select only those inventories which are most relevant for his curriculum objectives or

research goals.

Most of the inventories developed thus far were devised by analyzing written curricula; observing classroom behavior; interviewing curriculum supervisors, specialists, and teachers; reviewing professional journals; and from a "learning sets" type of task analysis. Some inventories are not specifically related to statements of current educational goals, or curricula, but arise out of an analysis of requisite skills needed at a particular level.

The development of the ECI is based on the requirement that the inventories can be easily administered, easily scored, are interesting and appropriate for socially disadvantaged children. The latter point is especially relevant for this project, since much criticism has been leveled at currently available instruments as being culturally biased against the disadvantaged. Great pains have been taken by the ECIP staff to make the inventories "fair" tests for the disadvantaged. Most of the pilot and standardization work to date has been done with low socio-economic Negro urban children.

Following is an outline of the Early Childhood Inventories presently available, with a brief description of each.

EARLY CHILDHOOD INVENTORIES

Experimental versions of the following inventories are available. Additional inventories are planned for the future. The listing below is followed by a short description of each of the inventories.

A. General Identification

1. Body Parts Name Inventory (BPNI)
2. Color Name Inventory (CNI)
3. Shape Name Inventory (SNI)
4. Classroom Objects Vocabulary Inventory (COVI)

B. Pre-Mathematics and Mathematics

1. Relational Concepts Inventory/Pre-Mathematics (RCI/PM)
2. Quantity Matching Inventory-1/Mathematics (QMI-1/M)
3. Set Matching Inventory/Mathematics (SMI/M)
4. Numeral Name Inventory-1 (NNI-1)

C. Pre-Science and Science

1. Relational Concepts Inventory/Pre-Science (RCI/PS)

D. General Concepts

1. Same/Different Inventory-1 (S/DI-1)
2. Same/Different Inventory-2 (S/DI-2)
3. Same/Different Inventory-3 (S/DI-3)

E. Reading, Spelling and Articulation

1. Alphabet Name Inventory/Printed Upper Case (ANI/PUC)
2. Alphabet Name Inventory/Printed Lower Case (ANI/PLC)

F. Linguistic Concepts

1. Comparatives Inventory/Linguistic Concepts (CI/LC)
2. Superlatives Inventory/Linguistic Concepts (SI/LC)
3. Prepositions Inventory/Linguistic Concepts (PI/LC)

Brief Descriptions of Inventories:

A. General Identification

1. Body Parts Name Inventory (BPNI)

The BPNI is an individually administered inventory designed to evaluate the child's ability to identify ten parts of his body -- chin, stomach, neck, arm, knee, ankle, thigh, cheek, wrist, knuckles. In addition, the child must indicate some understanding of the functions of five other body parts -- feet, head, nose, hand, tongue. The items included in the BPNI are a mixture of "easy" and "hard" items.

The BPNI is divided into three separate tasks: a nonverbal receptive task, a verbal expressive task, and a verbal identification (of functions) task. In the nonverbal receptive task, the child is required to point to designated body parts as they are named by the administrator. In the verbal expressive task, the administrator indicates a particular body part and the child must supply the correct name for it. In the verbal identification (of functions) task, the child has to respond to an incomplete sentence with the name of the appropriate body part. The proper sequence for the administration of this inventory is nonverbal receptive task followed by the verbal expressive task, and then the verbal function task.

2. Color Name Inventory (CNI)

The CNI is an individually administered inventory designed to evaluate the child's ability to identify twelve common colors -- black, blue, brown, gray, green, orange, pink, purple, red, tan, white, and yellow.

The CNI consists of two separate tasks -- a nonverbal task and a verbal task. In the non-verbal receptive task, the child is presented with 12 arrays of four colored squares each. The child is asked to point to specific colors present in the arrays as they are named by the administrator. Each array contains two relatively familiar colors and two relatively unfamiliar colors. In the verbal expressive task, the child is presented with each color, one at a time, and is asked to name it. The nonverbal task is administered first, followed by the verbal task.

Alternate presentation forms of the nonverbal task of the CNI are possible and may be used to evaluate guessing and positional response set behaviors. If accurate diagnostic information is desired for very young children, both nonverbal presentation forms should be administered. The two presentation forms of the CNI differ only in the arrangement of the colored squares in the same array, i.e., in Set (or form) B, position 1 contains the colored

squares that were in position 4 in Set A. Positions 1, 2, 3, 4 in Set A respectively positions 4, 3, 2, 1 in Set B.

3. Shape Name Inventory (SNI)

The SNI is an individually administered inventory designed to evaluate the child's ability to identify eight common shapes -- circle, cross, diamond, heart, rectangle, square, star, and triangle.

The SNI consists of two separate tasks -- a nonverbal task and a verbal task. In the nonverbal receptive task, the child is presented with eight arrays of four shapes each. The child is asked to point to specific shapes present in the arrays as they are named by the administrator. Each array consists of two relatively familiar shapes and two relatively unfamiliar shapes. In the verbal expressive task, the child is asked to name each of the shapes as they are presented to him one at a time. The nonverbal task is administered first followed by the verbal task.

Alternate forms of the nonverbal task of the SNI have been developed to aid in the evaluation of guessing and positional set behaviors. If accurate diagnostic information is desired for very young children, both nonverbal forms should be administered. The two forms of the SNI differ only in the arrangement of the shapes in the same array, i.e., in Set (or Form) B, position 1 contains the shapes that were in position 3 in Set A. Positions 1, 2, 3, 4 in Set A respectively become positions 3, 4, 1, 2 in set B.

4. Classroom Objects Vocabulary Inventory (COVI)

The COVI is an individually administered inventory designed to evaluate the child's ability to identify receptively 60 objects that are commonly found in well-equipped preschool classrooms. The 60 critical objects have been broken down into six categories containing ten items each. These categories deal with items associated with housekeeping activities, cognitive activities, general activities, music, arts and crafts, and basic classroom equipment.

The 60 critical objects are presented to the child in the context of 60 arrays of four pictures each. The pictures are arranged in quadrants. Each of the arrays contains the critical object, another object from the same category as the critical object, an object that never appears as a test item, and an object that is tested in another array. The child is asked to point to specific objects present in the arrays as they are named by the administrator.

Because of the design of the inventory, it may be possible to evaluate interest as well as vocabulary. This possibility, however, remains to be demonstrated.

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evaluate interest as well as vocabulary. This possibility, however, remains to be demonstrated.

The COVI has been specifically designed so that there are equivalent forms available for purpose of retesting.

B. Pre-Mathematics and Mathematics

1. Relational Concepts Inventory/Pre-Mathematics (RCI/PM)

The RCI/PM is an individually administered inventory designed to assess the child's receptive understanding of sets of concepts which are prerequisite to the learning of many quantitatively related concepts and which are especially relevant to the understanding of mathematical sets.

The inventory consists of twenty items. These items are used to make up ten sets of two-choice polar opposite concepts: first-last, few-many, apart-together, empty-full, equal-unequal, beginning-end, all-none, open-closed, top-bottom, and right-left. The child is asked to point to the items which represent the concept asked for by the administrator. Each of the ten sets of concepts has either:

- 1) two pictures, each of which represents one of the two opposite concepts -- e.g., the concept "few-many" is depicted by a picture of a bowl full of crackers and a picture of a bowl containing only a few crackers.
- 2) one picture which represents both concepts -- e.g., the concept "first-last" is depicted by a picture of horses in a race, one of which is clearly first and one of which is clearly last.

To evaluate guessing and positional response set behavior, the sets of twenty items are administered twice. The critical items asked for in the second administration are the opposite of the critical items asked for in the first administration. For example, when the child is shown the picture of the horses in the race during the second administration, he is asked to point to the horse which is last in the race rather than the one that is first.

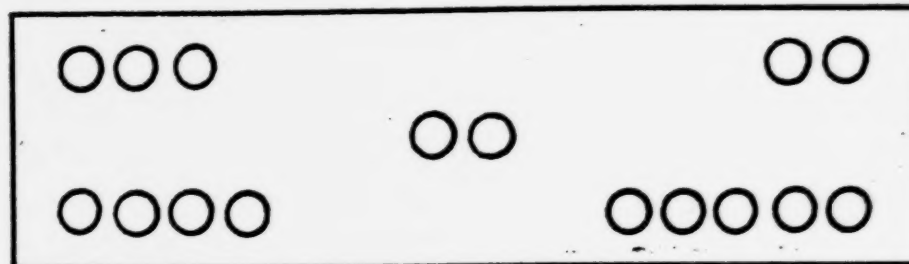
The forty items (twenty pairs, each presented twice on the RCI/PM) make it possible to obtain a reliable estimate of the child's knowledge of each set of polar opposite concepts (e.g., "fullness" -- full-empty). Such construction also allows for the balancing of position and concept, thus controlling for influences of positional response sets.

2. Quantity-Matching Inventory-1/Mathematics (QMI-1/M)

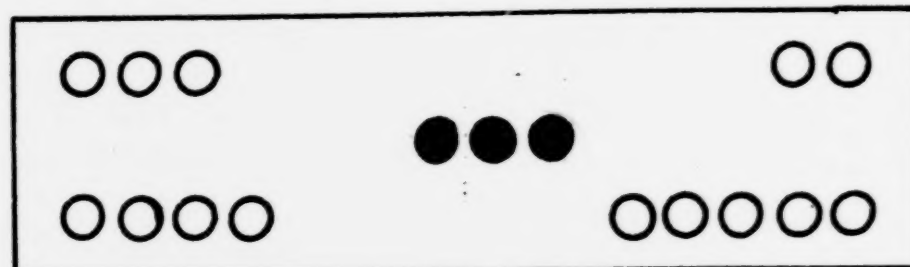
The QMI-1/M is an individually administered inventory designed to evaluate the child's receptive ability to match quantities regardless of the nature of the attributes of the stimulus items. The quantities the child is asked to match range from two through five. The child has to choose from among four alternatives (located at the corners of the page), the correct choice having the same quantity as a standard (located at the center of the page).

The QMI-1/M is divided into four levels of complexity based on variations of irrelevant stimulus attributes:

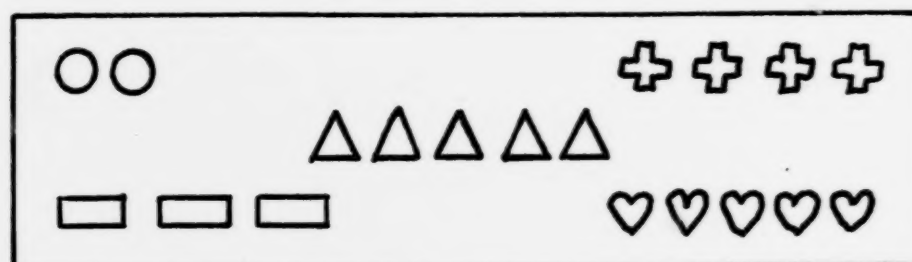
- 1) In the first level, the only difference between the alternatives is the quantity itself. Example:



- 2) In the second level, the child must select the quantity match from alternatives that are of different achromatic color (black or white) from the standard. Example:



- 3) In the third level, the alternatives differ in shape from each other, as well as from the standard shape. Example:



- 4) In the fourth level, the child must select the quantity match from alternatives which have mixed shapes. Example:



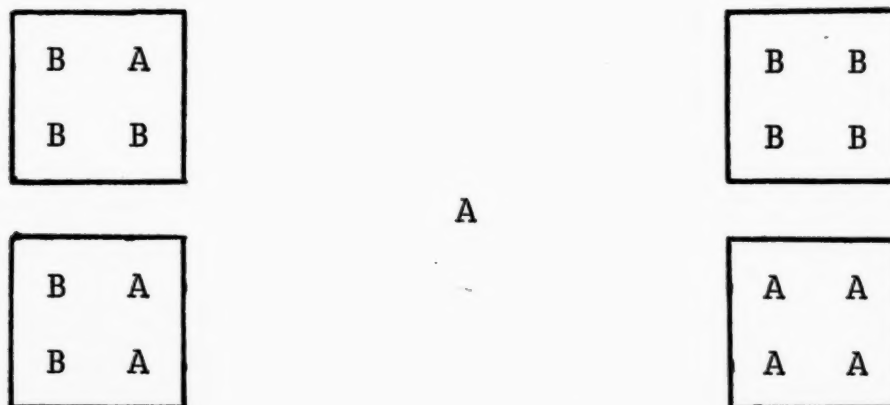
For the purpose of retesting and to aid in the evaluation of guessing and response set behavior, equivalent forms of the QMI-1/M have been developed. The forms differ in the stimuli used and in the position of the correct matching alternatives.

3. Set Matching Inventory/Mathematics (SMI/M)

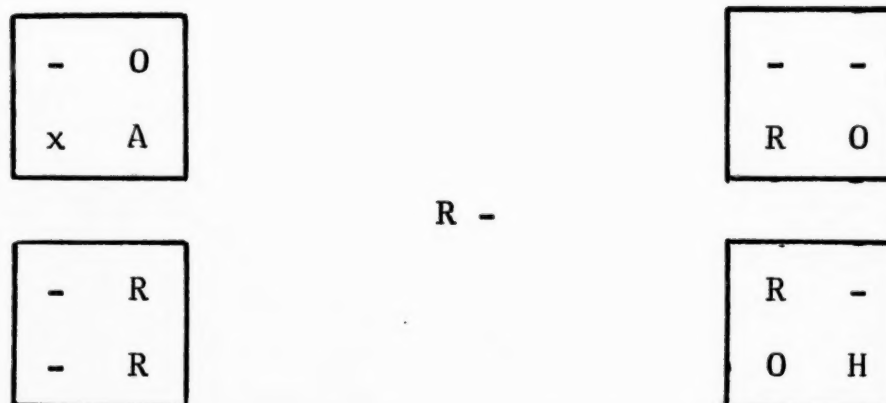
The SMI/M is an individually administered inventory designed to evaluate the child's receptive ability to match stimuli according to their common attributes.

The child is asked to point to a box, from among four alternatives, arranged in boxed quadrants at the corners of the page, which contains only the "standard" item(s) which is indicated by the administrator. The standard appears unboxed in the center of the page.

The SMI/M consists of 12 items divided into two parts. The first contains the "easier" unmixed sets. At this level, the child must choose the alternative whose components are all identical to the standard. In the example below, the child must choose the set containing only the A's:



The second level contains the "harder" mixed or conjunctive sets. Here the child must choose the alternative that contains only the components of the standard. In the example below the child must choose the lower left-hand box:



For purposes of retesting and to aid in the evaluation of guess and response set behaviors, equivalent forms of the SMI/M have been developed. The two forms differ in the stimuli used and in the position of the correct alternative.

4. Numeral Name Inventory-1 (NNI-1)

The NNI-1 is an individually administered inventory designed to evaluate the child's ability to identify twenty common numbers -- from 0 to 19.

The NNI-1 consists of two separate tasks -- a nonverbal task and a verbal task. In the nonverbal receptive task, the child is presented with 20 arrays of four numbers each. The child is asked to point to specific numbers present in the arrays as they are named by the administrator. Each array contains the critical numeral, two distractors (which are visually and aurally highly discriminable from the critical number -- one a single-digit and one a two-digit numeral), and one distractor which is the unit or teen number containing the same number as the critical unit (e.g., 12 for the critical number 2, 16 for 6, etc.). This arrangement of the arrays requires the child to make finer discriminations than is ordinarily the case and does not easily permit the child to make a correct choice because he knows a part of the numeral (the 6 of the 16, for example). Familiar pictures are systematically placed among the nonverbal items in order to draw the child's attention to all positions in the arrays.

In the verbal expressive task, the child is presented with each number, one at a time, and is asked to name it. The non-verbal task is administered first, followed by the verbal task.

Alternate forms of the nonverbal task of the NNI-1 have been developed to aid in the evaluation of guessing and positional response set behaviors. If accurate diagnostic information is desired for very young children, both nonverbal forms should be administered. The two forms differ only in the arrangement of the numerals in the same array.

C. Pre-Science and Science

1. Relational Concepts Inventory/Pre-Science (RCI/PS)

The RCI/PS is an individually administered inventory designed to assess the child's receptive understanding of sets of concepts related to the scaling of physical dimensions. These concepts deal with weight, temperature, height, speed, size, distance, width, humidity, and age.

RCI/PS consists of ten sets of pictorial representations of two-choice polar opposite concepts: hot-cold; slow-fast; long-short; wet-dry; big-little; near-far; light-heavy; narrow-wide; fat-thin; and old-young. The child is asked to point to the picture which represents the concept asked for by the administrator. For example, the child is presented a picture of a snowman and a picture of the sun, and is asked to point to the one which is hot. Each of the ten sets of concepts has two corresponding sets of stimuli, for a total of twenty items. For example, the concept hot-cold has a picture of the sun and a snowman, and a picture of a fire and ice-cream.

To aid in the evaluation of guessing and positional response set behaviors, the twenty sets should be administered twice. The critical items asked for in the second administration are the opposite of the critical items asked for in the first. For example, when the child is shown the pictures of the snowman and the sun in the second administration, he is asked to point to the one which is cold rather than the one which is hot.

The forty tested items (twenty items tested twice) on the RCI/PS make it possible to obtain a reliable estimate of the child's knowledge of each set of polar opposite concepts. Such construction also allows for the balancing of position and concept, thus controlling for influences of positional response sets.

D. General Concepts

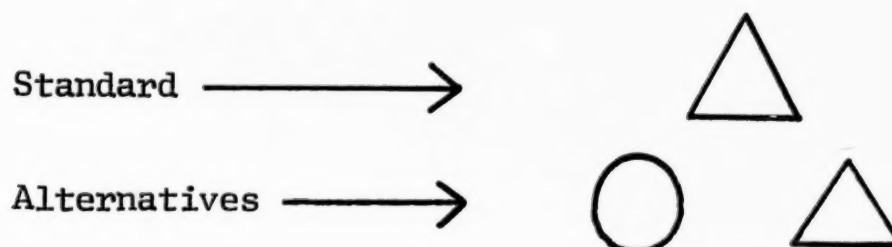
1. Same/Different Inventory-1 (S/DI-1)

The S/DI-1 is an individually administered inventory designed to evaluate the child's receptive understanding of the concepts "same" and "different."

The S/DI-1 consists of two 12-item tasks. In the same task, the child is asked to point to the picture, from a set of two alternatives, which is exactly the same as the standard picture located above and in the center of the two alternatives). In the different task, the child is shown the same set and asked to point to the picture which is different from the standard. (See example below.) The same task is administered first, followed by the dif-

ferent task. Example items precede each task.

The S/DI-1 was constructed to measure the child's conceptual understanding of same/different when there is no perceptual confusion present and without relying on highly developed discrimination skills. Following is an example from this inventory:



As can be seen from the example above, one of the alternatives is identical to the standard, the other is perceptually quite different. Items were constructed using variations among six categories: size, shape, numerals, letters, internal design, and meaningful objects. Each of the six categories is evaluated twice and there are four example items.

The use of twelve items means that if the child makes no more than two errors, the administrator can still conclude that the child has performed well enough to know the concepts. In this case, the administrator may wish to regard the inventory as providing a pass/fail measure. This allowance for errors is an attempt to take into account momentary lapses of attention on the part of the young child.

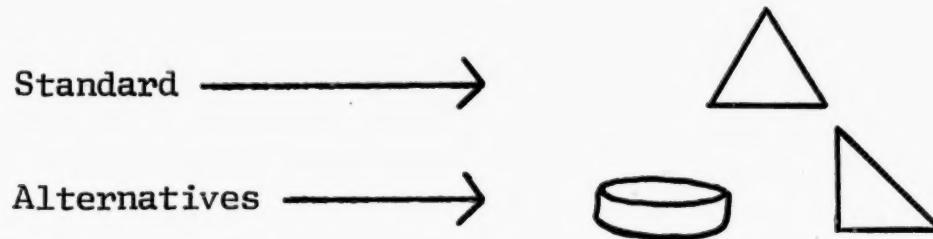
2. Same/Different Inventory-2 (S/DI-2)

The S/DI-2 is an individually administered inventory designed to evaluate the child's receptive understanding of the concepts "more like" and "more different."

The S/DI-2 consists of two 12-item tasks. In the more like task, the child is asked to point to the picture, from two alternatives, which is more like the standard picture (located above and in the center of the two alternatives). In the more different task, the child is shown the same sets and asked to point to the picture which is more different from the standard picture. The more like task is administered first, followed by the more different task. Example items precede each task.

In the S/DI-2, in order for the child to choose correctly from the alternatives, he may attend either to perceptual and/or conceptual similarities between the choices and the standard. For example (see sample item below), the child may perceive that the standard and the "correct" comparison both have straight lines. Or, the child may identify or label the standard as a "triangle"

and choose the "correct" alternative because it belongs conceptually to the same class of objects as the standard.



As can be seen from the above example, one of the alternatives is conceptually identical and perceptually similar to the standard; the other alternative differs from the standard both conceptually and perceptually.

Items were constructed using variations among six categories: size, shape, numerals, letters, internal design, and meaningful objects. Each of the six categories is evaluated twice and there are four example items.

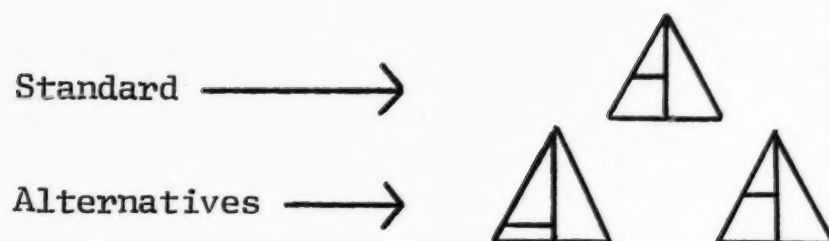
The use of twelve items means that if the child makes no more than two errors the administrator can still conclude that the child has performed well enough to know the concepts. In this case, the administrator may wish to regard the inventory as providing a pass/fail measure. The allowance for errors is an attempt to take into account momentary lapses of attention on the part of the young child.

3. Same/Different Inventory-3 (S/DI-3)

The S/DI-3 is an individually administered inventory designed to evaluate the child's receptive understanding of the concepts -- "exactly the same" and "different."

The S/DI-3 consists of two 12-item tasks. In the exactly the same task, the child is asked to point to the picture, from two alternatives, which is exactly the same as a standard picture located above and to the center of the two alternative pictures. In the different task, the child is shown the same sets and asked to point to the picture which is different from the standard. The exactly the same task is administered first, followed by the different task. Example items precede each task.

The S/DI-3 was constructed to measure the child's conceptual understanding of these two concepts when there is present some degree of perceptual confusion. In order for the child to choose correctly between the alternatives, he must attend closely to subtle differences. Following is a sample item:



As can be seen above, one of the alternatives is identical to the standard; the other differs only in the placement of the line parallel to the base of the triangle.

Items were constructed using variations among six categories: size, shape, numerals, letters, internal design, and meaningful objects. Each of the six categories is evaluated twice and there are four example items.

The use of twelve items means that if the child makes no more than two errors, the administrator can conclude that the child has performed well enough to know the concepts. In this case, the administrator may wish to regard the inventory as providing a pass/fail measure. This allowance for errors is an attempt to take into account momentary lapses of attention on the part of the young child.

E. Reading, Spelling and Articulation

1. Alphabet Name Inventory/Printed Upper Case (ANI/PUC)

The ANI/PUC is an individually administered inventory designed to evaluate the child's ability to identify the twenty-six upper-case letters of the alphabet.

The ANI/PUC consists of two separate tasks -- a nonverbal task and a verbal task. In the nonverbal receptive task, the child is presented with 26 arrays of four letters each. The child is asked to point to specific letters present in each array as they are named by the administrator. The first 13 letters asked for are those which occur most frequently in words typically used to teach initial reading and spelling skills. Each array contains two relatively high frequency letters and two relatively low frequency letters. The distractor letters are both visually and aurally highly discriminable from the critical letter. Familiar pictures are systematically placed among the nonverbal items to draw the child's attention to all positions in the arrays.

In the verbal expressive task, the child is presented with each letter one at a time and is asked to name it. The nonverbal task is administered first, followed by the verbal task.

Alternate forms of the nonverbal task have been developed to aid in the evaluation of guessing and positional response set be-

haviors. If accurate diagnostic information is desired for very young children, both nonverbal forms should be administered. The two forms of the ANI/PUC differ only in the arrangement of the numerals in the same array. In Set B, position 1 contains the numerals that were in position 3 in Set A. Positions 1, 2, 3, 4 in Set A become, respectively, positions 3, 4, 1, 2 in Set B.

2. Alphabet Name Inventory/Printed Lower Case (ANI/PLC)

The ANI/PLC is an individually administered inventory designed to evaluate the child's ability to identify the twenty-six lower-case letters in the alphabet.

The ANI/PLC consists of two separate tasks -- a nonverbal task and a verbal task. In the nonverbal receptive task, the child is presented with 26 arrays of four letters each. The child is asked to point to specific letters present in the arrays as they are named by the administrator. The first 13 letters asked for are those which occur most frequently in words typically used to teach initial reading and spelling skills. Each array contains two relatively high frequency letters and two relatively low frequency letters. The distractor letters are both visually and aurally highly discriminable from the critical letter. Familiar pictures are systematically placed among the nonverbal items to draw the child's attention to all the positions in the arrays.

In the verbal expressive task, the child is presented with each letter, one at a time, and is asked to name it. The nonverbal task is administered first, followed by the verbal task.

Alternate forms of the nonverbal task of the ANI/PLC have been developed to aid in the evaluation of guessing and positional response set behaviors. If accurate diagnostic information is desired for very young children, both nonverbal forms should be administered. The two forms of the ANI/PLC differ only in the arrangement of the numerals in the same array. In Set B, position 1 contains the numerals that were in position 3 in Set A. Positions 1, 2, 3, 4 in Set A become, respectively, positions 3, 4, 1, 2 in Set B.

F. Linguistic Concepts

1. Comparatives Inventory/Linguistic Concepts (CI/LC)

The CI/LC is an individually administered inventory designed to evaluate the child's receptive understanding of the comparative case.

The CI/LC consists of twelve two-choice comparative concepts represented pictorially: taller, shorter, bigger, smaller, fatter, thinner, older, younger, happier, sadder, slower, and faster. The child is asked to point to the picture which represents the comparative asked for by the administrator. The concepts tapped are as-

sumed to be already in the child's receptive vocabulary, since the inventory seeks to determine the child's ability to understand the comparative case and not his knowledge of the particular concepts. It is therefore recommended that the child first be administered the Relational Concepts Inventory/Pre-Science (RCI/PS) which tests the child's receptive understanding of many of the concepts included in the CI/LC.

To reduce the possibility that the child is guessing the correct alternative by knowing the concept rather than the comparative case, the stimuli are chosen so that both choices, as far as possible, represent the same concept (for example, both girls are fat, but one girl is fatter than the other).

The use of twelve items means that if the child makes no more than two errors, the administrator can still conclude that the child receptively understands the use of the comparative case. In this event, the administrator may wish to regard the inventory as providing a pass/fail measure. The allowance for errors is an attempt to take into account momentary lapses of attention on the part of the young child.

Equivalent forms of the CI/LC have been developed for retesting purposes.

2. Superlatives Inventory/Linguistic Concepts (SI/LC)

The SI/LC is an individually administered inventory designed to evaluate the child's receptive understanding of the superlative case.

The SI/LC consists of twelve three-choice superlative concepts represented pictorially: tallest, shortest, biggest, smallest, fattest, thinnest, oldest, youngest, happiest, saddest, slowest, and fastest. The child is asked to point to the picture which represents the superlative asked for by the administrator. The concepts tapped are assumed to be already in the child's receptive vocabulary, since the inventory seeks to determine the child's ability to understand the superlative case and not his knowledge of the particular concepts. It is therefore recommended that the child first be administered the Relational Concepts Inventory/Pre-Science (RCI/PS) which tests the child's receptive understanding of many of the concepts included in the SI/LC.

To reduce the possibility that the child is guessing the correct alternative by knowing the concept rather than the superlative case, the stimuli are chosen so that the three choices, as far as possible, represent the same concept (for example, two of the three girls are fat or fatter than the third girl, but one girl is fattest of the three).

The use of twelve items means that if the child makes no more than three errors, the administrator can still conclude that the child receptively understands the use of the superlative case. In this event, the administrator may wish to regard the inventory as providing a pass/fail measure. The allowance for errors is an attempt to take into account momentary lapses of attention on the part of the young child.

Equivalent forms of the SI/LC have been developed for retesting purposes.

3. Prepositions Inventory/Linguistic Concepts (PI/LC)

The PI/LC is an individually administered inventory designed to evaluate the child's ability to recognize the use of sixteen prepositions -- against, among, around, away from, behind, between, beside, down, in, in front of, on, over, through, toward, up, and under.

The child is presented with sixteen arrays of four pictures each and is asked to point to the picture that represents the preposition named by the administrator.

The sixteen arrays are designed so that each array may be used to evaluate at least two different prepositions. Thus the PI/LC has equivalent forms which may be used for retesting and to aid in the evaluation of guessing and positional response set behaviors. If accurate diagnostic information is desired for very young children, both forms should be administered.

Institute for Developmental Studies
School of Education
New York University

Use of ECI for Evaluation

Abstract of: Victor, J. and Collier, A.R., Preliminary Report on
the Use of Several Early Childhood Inventories
for the Evaluation of Educational Programs.*
(mimeo)

The Early Childhood Inventories Project (ECIP) was initiated at the Institute for Developmental Studies for the purpose of developing original aptitude/achievement-type inventories which could be used to assess very specific behaviors of young children.

Six of these inventories (Body Parts Name; Color Name; Shape Name; Numeral Name-1; Same/Different-3; Alphabet Name) were administered to 220 prekindergarten, kindergarten, and first-grade low socioeconomic Negro children from the Harlem area of New York City. The six inventories yielded thirteen measures. The children attended either IDS enrichment classes, a Head Start program, or regular New York City Board of Education classes.

Assuming initial equivalence of groups, the results appear to indicate that selected prekindergarten experience enhances educational development, at least in those skills measured in this study. The results also indicate that the Institute's enrichment program

*The complete report is included in the Appendix, p. 167.

has greater educational value than the Head Start program evaluated. The Head Start program also proved more beneficial on some measures than no prekindergarten experience.

Institute children obtained significantly higher scores than the Head Start children on seven of the thirteen measures and significantly higher scores than the children with no formal prekindergarten experience on eleven of the measures. The Head Start group obtained significantly higher scores on four measures than the group of children with no formal prekindergarten experience.

Of special interest is the finding that Institute children entering kindergarten obtained equivalent scores to a group of children having had no formal prekindergarten and now entering first grade. It is possible to conclude that the Institute for Developmental Studies enrichment program has advanced the children about a year in their educational development.

Institute for Developmental Studies
School of Education
New York University

Based on: Deutsch, Cynthia P. "Patterns of Perceptual, Language, and Intellectual Performance in Children with Cognitive Deficits."*

The Institute for Developmental Studies has studied cognitive, perceptual, and linguistic development in young children. Within these studies there has been special concern with those limitations on such growth and development which appear traceable to social deprivation. A major goal of Institute studies has been examination of the operation of interaction effects. Since these studies are longitudinal in design, they require assessment of the effects of intervention procedures at various times and points in the pre-school and school career of socially disadvantaged children.

The present research is formulated to tap the effects of an extended enrichment program on a group of disadvantaged children and to compare these results with those from an equated group of disadvantaged children without enrichment experience.

The subjects for the present study were in the first grade in September, 1964, when testing began. They comprise the entire group of children who were enrolled in the 1962-1963 preschool enrichment classes organized and conducted by the Institute for Developmental Studies, and the children who, at the same time, had

*Progress Report to the Department of Health, Education, and Welfare, May, 1967. Principal Investigator: Cynthia P. Deutsch.

been selected for the control group. The enrichment group (experimental group) had been enrolled in the special classes for the pre-school and the kindergarten years and were in the special first grade classes at the time this project began. Their number was 40. The control group included the original 40 control subjects still in contact with the program. The groups did not differ on the Institute's Socio-Economic Status Scale, sex, age, or preschool I.Q. They attended classes conducted in two different schools.

There is a great deal of family mobility in the groups from which the subjects were drawn, and there was some attrition in the size of the samples. The experimental group at the conclusion of the study consisted of 40 subjects, while the control group consisted of 36 subjects.

After due consideration of the aims of the study and the characteristics of the various available tests, seven instruments were administered: 1) Illinois Test of Psycholinguistic Abilities; 2) Kendler Concept Formation Technique; 3) Wepman Auditory Discrimination Test; 4) Gates Reading Test; 5) Institute for Developmental Studies-version Continuous Performance Test, in which the child must press a button whenever a red dot is presented on a memory drum, but inhibit pressing when dots of any other color appear; 6) Institute for Developmental Studies Drum Test (Auditory-Motor Test), in which the child listens to musical tunes and must reproduce the sound patterns on a drum; and 7) Institute for Developmental Studies Verbal Identification Test, in which spontaneous descriptions of stimulus cards are elicited from the child.

A multivariate analysis of the data has been completed and a final report is in preparation.

Institute for Developmental Studies
School of Education
New York University

Report on Reading Achievement

In the Interim Progress Report to the Ford Foundation (Part I), p. 211, the reading achievement of the 1966-67 first-grade enrichment classes was reported, using the Gates-MacGinitie Reading Test. In the spring of 1968, the Gates-MacGinitie was readministered to evaluate the progress of experimental and control children in the 1967-68 first-, second-, and third-grade classes. In addition, the Metropolitan Reading Test was administered by local school personnel and these third-grade scores were secured by the Institute's evaluation staff. Data from these tests are described below.

Gates-MacGinitie:

In 1966-67, on the Vocabulary subtest, first-grade pupils scored significantly higher than their controls (CSS). This year (1967-68), as second-graders, the experimentals maintained their advantage over the control group on the Vocabulary subtest. This represents statistically significant difference at the .01 level. On the comprehension subtest, the second-grade enrichment pupils scored at the 2.2 level, while their controls achieved an average score of 1.6. This represents a statistically significant differ-

ence at the .025 level. (See Table 1.)

When the Gates-MacGinitie vocabulary subtest was administered to the 1967-68 third-grade classes, the experimental pupils achieved a grade level of 3.1, while the control children test at the 2.6 level (no significant difference). On the Gates comprehension test, there was less difference between the performance of the third-grade experimentals and controls: experimentals performed at the 2.5 level and the controls at the 2.4 grade level. (See Table 1.)

The performance of the first-grade classes on the Gates-MacGinitie is somewhat puzzling. On the vocabulary subtest, the experimentals tested at the 1.6 grade level while the controls were at the 2.0 level. On the comprehension subtest, experimental children scored at the 1.6 level and the controls at the 1.8 level. None of these differences was statistically significant. However, it is important to remember that there were only 11 pupils in the control (C_{SS}) group. Thus, a selection factor may in some way have biased the comparatively high scores of these control children. Furthermore, in the past year we have found that many of our C_{SS} pupils had benefited from various preschool enrichment programs, Project Head Start in particular, so that the C_{SS} group may no longer represent any of the original control group specifications. The original concept of a control group may, in fact, be unrealistic in view of the massive dissemination of a wide range of enrichment programs of varying duration and effectiveness.

Metropolitan Reading Test:

It is interesting to note that on the Metropolitan Reading

Test, all third-grade groups scored considerably higher than on the Gates-MacGinitie. (See Table 3.) On the Metropolitan Word Knowledge (vocabulary) subtest, experimentals achieved an average grade level score of 3.7, while third-grade controls were at the 3.0 level (a statistical significance of .01). Thus, on the Metropolitan vocabulary test, Institute children scored about six months higher than on the Gates-MacGinitie, and were only one month below national grade level. The results of the Metropolitan Reading (comprehension) subtest for third grade are also encouraging. On this test, Institute children scored about five months above the non-enriched group, with a grade level of 3.4 as opposed to 2.9.

For a while P.S. 175, in which some of the Institute's demonstration classes are held, underwent a period of disintegration and lack of leadership, which made it impossible to collect Metropolitan test data for control children from this school. Thus, no data from P.S. 175 were included in the Metropolitan mean grade level scores for grade three. Since disturbances at P.S. 175 cut down considerably on instructional time, the Institute's evaluation staff felt that this would have an adverse effect on the pupils' achievement and would therefore negatively bias the mean scores.

The Gates-MacGinitie scores reported above, however, do include data from P.S. 175 (Table 1). Table 2 reports the Gates scores without 175 data. A comparison of these two Tables will show that the Gates-MacGinitie average grade level scores may have been somewhat depressed as a result of the chaos prevalent at P.S. 175 at the time of testing.

Table 1

Mean Grade Equivalent Score for Gates-MacGinitie Reading Test for IDS (E) Children and Control Children* for P.S. 68, 79, 90, 175 Combined. (Test Administered May, 1968)

GRADE	VOCABULARY				COMPREHENSION			
	E	CSS	T TEST		E	CSS	T TEST	
1	1.6 (N=37)	20 (N=11)	P < .05		1.6 (N=37)	1.8 (N=11)	N.S.	
2	2.5 (N=37)	1.7 (N=17)	P < .01		2.2 (N=37)	1.6 (N=17)	P < .025	
3	3.1 (N=21)	2.6 (N=13)	N.S.		2.5 (N=21)	2.4 (N=13)	N.S.	

*E - IDS Children
CSS - Self-Selected Children

Table 2

Mean Grade Equivalent Scores for Gates-MacGinitie Reading Test for IDS (E) Children and Control Children* for P.S. 68, 79, 90 Combined. (Test Administered May, 1968)

GRADE	VOCABULARY				COMPREHENSION			
	E	CSS	T TEST		E	CSS	T TEST	
1	1.5 (N=23)	1.7 (N=7)	N.S.		1.5 (N=23)	1.6 (N=7)	N.S.	
2	2.5 (N=21)	1.6 (N=14)	P < .01		2.3 (N=21)	1.6 (N=14)	P < .01	
3	3.3 (N=13)	2.6 (N=12)	P < .01		2.6 (N=13)	2.5 (N=12)	N.S.	

*E - IDS Children
CSS - Self-Selected Controls

Table 3

Mean Grade Equivalent Score for Metropolitan Reading Test for IDS (E) Children and Control Children* for P.S. 68, 79, 90 Combined. (Test Administered May, 1968)

GRADE	Word Knowledge (Vocabulary)				Reading (Comprehension)		
	E	CSS	T TEST		E	CSS	T TEST
3	3.7 (N=11)	3.0 (N=11)	P < .01		3.4 (N=11)	2.9 (N=11)	N.S.

*E - IDS Children
CSS- Self-Selected Children

Institute for Developmental Studies
School of Education
New York University

The Longitudinal Enrichment Study

Based on: Goldstein, L., and Deutsch, M. "Evaluation of an Enrichment Program for Socially Disadvantaged Children." June, 1965 (mimeo).*

_____. "An Evaluation of the Effectiveness of an Enriched Curriculum in Overcoming the Consequences of Environmental Deprivation." June, 1966 (mimeo).*

_____. Supplementary Report. October, 1967 (mimeo).*

_____. Supplementary Report. November, 1967 (mimeo).*

_____. Progress Report. December, 1967 (mimeo).*

_____. Progress Report. June, 1968 (mimeo).**

Deutsch, M., Goldstein, L. and Deutsch, Cynthia. "Initial Report of Assessment of a Longitudinal Program." 1968 (mimeo).

Since 1962, the Institute for Developmental Studies has been experimenting with the early educational enrichment of disadvantaged children. Initially, the program proposed to provide two years of pre-first-grade enrichment to four-year-old children from depressed areas. As data were gathered from various concurrent cross-sectional studies, it became clear that, in the absence of enriched curricula,

*Progress Reports to the Office of Education. Project Director: Martin Deutsch. Project Co-Director: Leo Goldstein.

**The complete report is included in the Appendix, p. 201.

disadvantaged children tended to fall proportionately farther behind their middle-class peers as they progressed through their largely segregated slum schools. Therefore, the Institute's demonstration program was expanded (in 1964) to encompass a total of five years of enrichment, from the nursery year through third grade.

In order to evaluate the effectiveness of the Institute's enrichment program, psychological and educational assessment of experimental and control children is conducted on a pre- and posttest basis starting at the beginning of pre-kindergarten and continuing, at designated intervals, until completion of third grade. All children will be further evaluated at intervals as they progress through non-enriched public school grades.

The Institute's evaluation program focusses on the following areas: general intelligence, language development, conceptual and perceptual abilities, and reading achievement.

The evaluation instruments used include: the Stanford-Binet Intelligence Scale, the Peabody Picture Vocabulary Test, the Columbia Mental Maturity Scale, the IDS Reading Prognosis Test,* the Lorge-Thorndike Intelligence Test,* the Gates-MacGinitie Reading Test and the Metropolitan Reading Test.** In addition, various other measures are used from time to time, ranging from the Illinois Test of Psycholinguistic Abilities to limited range, non-standardized measures of particular curriculum elements. Among the latter are the IDS-developed Phonics Checklist and the Early Childhood

*Data analysis on these two tests is as yet incomplete.

**Separate sections on Reading Achievement (including the Gates MacGinitie and the Metropolitan Reading Test) and the Early Childhood Inventories are included in this Report on pp. 99 and 95.

Inventories.**

The experimental subjects comprise six subgroups or "waves"; one experimental pre-kindergarten group was launched each school year, from 1962-63 (Wave 1) through 1967-68 (Wave 6). The first two waves must be considered pilot groups, having been exposed to our preliminary, exploratory attempts to construct consistent enrichment procedures. As a result, they were subjected to somewhat less effective materials and methods, more organizational problems, than succeeding experimental groups. First wave experimental children began their first year (pre-kindergarten) late, and both waves were in school only four mornings a week. First grade for these children was barely different from the regular first grade, because of shortage of funds for innovations at that grade level until late in the year. They experienced some changes in curriculum in their second and third grade years, but the innovations, especially in the highly critical reading program, were minimal. The first experimental group which was exposed to the full range of enriched curriculum, Wave 3, was in the second grade during the 1967-68 school year.

Children assigned to the experimental group are selected on the basis of the following criteria:

- 1) the child must be eligible for admission to kindergarten, according to the rules of the Board of Education, in September of the following year
- 2) the parent(s) must be prepared to assume responsibility for the child's regular attendance

- 3) the child and parent(s) must be English-speaking
- 4) the child must be in generally good physical condition, free of gross abnormalities or deficiencies in hearing or vision, and without any serious orthopedic difficulties
- 5) the child must have no serious emotional disturbances or severe behavior problems
- 6) the child must come from a family in the lower socio-economic level as defined by the Institute's Socio-Economic Status Index, which is based on the amount of education and the occupational status of the family's chief breadwinner. The subjects were all recruited on a voluntary basis, though effort was made to seek the children actively and not wait for parents to bring in their children in response to handbills and school announcements.

The control subjects fall into three main groups:

- 1) a control sample (C_{ss}) selected at the same time and with the same criteria as the experimental group described above. This control group and the experimental children are "self-selected" in that their parents applied to the Institute for the children's admission to the program, after the Institute had notified the community of its enrichment plans. The C_{ss} control sample serves as a control for this factor of self-selection.

- 2) a second control group (C_k) consists of children from the same background as the experimental and self-selected subjects, but they have had no previous nursery or pre-kindergarten experience and begin their formal schooling at the kindergarten level in regular, non-enrichment classes.

3) the third control group (C_1) consists of subjects from this low socio-economic background who have had no school experience prior to their entering regular, non-enrichment first-grade classes.

Also included in the subject population are "fillers," i.e., replacements for experimental subjects who, for various reasons, leave the program at some point before completion. The data on these "fillers," not reported here, are being treated separately because their selection, completed by school personnel rather than Institute personnel, appears to have been affected by many extraneous factors.

FINDINGS

Figure 1, below, summarizes the most recent findings of the Longitudinal Study in terms of differences between the mean scores of the experimental group and their self-selected controls. The Stanford-Binet (S-B) and the Peabody Picture Vocabulary Test (PPVT) were administered to experimental and control children at the beginning and end of pre-kindergarten and at the end of kindergarten. Data from the first four waves are combined; analyses for Wave 5 and Wave 6 are not available at this time.

The Stanford-Binet Intelligence Test was chosen for the basic battery largely because it is the single most reliable performance measure of children's intelligence currently available for use with the age range involved. The Peabody Picture Vocabulary Test was chosen because it measures receptive vocabulary. The Columbia Mental Maturity Scale, which measures non-linguistic concept at-

tainment, is also part of the basic battery instruments. The results of the CMMS will not be reported here (but are available) because an analysis of both the test and available data raises serious questions about the reliability of the instrument.

Figure I

Mean scores of Experimental and Self-Selected Control groups for combined Waves 1, 2, 3, and 4, at the three testing periods, on the Stanford-Binet Intelligence Test and the Peabody Picture Vocabulary Test.

		<u>Pretest</u>	<u>Posttest 1</u> (end of pre-K)	<u>Posttest 2</u> (end of K)
<u>S-B</u>	<u>E</u>	93.08	100.44	100.22
	<u>CSS</u>	92.05	92.59	96.21
<u>PPVT</u>	<u>E</u>	68.63	83.39	88.01
	<u>C_{SS}</u>	67.46	70.52	78.98

(Posttest 3 is given at the end of third grade. The third and fourth Waves have not yet completed third grade.)

As Figure I illustrates, the results of these tests are quite encouraging. At the time of pretesting, there were no significant differences between the enrichment and C_{SS} groups on either the Stanford-Binet or the Peabody. Thus, any systematic differences subsequently found may reasonably be assigned to the presence or absence of enrichment.

At posttesting at the end of pre-kindergarten and kindergarten, on both the S-B and the PPVT, the enrichment group scored significantly higher than the C_{SS} group and also improved significantly over their own pretest performance (for an Analysis of Variance,

see Tables 1 and 2 at the end of this summary).

It is also possible at this time to report some results of the Illinois Test of Psycholinguistic Abilities (ITPA), which measures language ability. In grades one through three, in which ITPA data were collected (see Figure 2, below), the Wave 1 experimental groups scored significantly higher than the controls. Further, the difference between the groups was greater in third grade than in earlier testings; the scores of the control group, on the other hand, declined from first to third grade. (An Analysis of Variance of the ITPA scores will be found in Table 3 at the end of this summary.) The progressive decrease of the ITPA scores of the control group shows the cumulative deficit often found to characterize the disadvantaged child. The ITPA data on the experimental group, which show an increase as late as third grade, suggest that the cumulative effect of a disadvantaging environment can be avoided by the use of effective intervention procedures.

Figure 2

Illinois Test of Psycholinguistic Abilities

Mean Scores, Averaged over Subjects for the Total ITPA Score, for Wave 1 experimental & control subjects in Two Schools (A & B), over Three Years of Testing*

	Grade 1 1964		Grade 2 1965		Grade 3 1966		TOTAL
EXPERIMENTAL	A N=19 243.15	B N=21 269.30	A N=19 232.06	B N=21 272.15	A N=19 251.13	B N=21 288.13	N=40 259.32
CONTROL	N=17 199.38	N=19 204.46	N=17 180.44	N=19 191.43	N=17 175.88	N=19 174.47	N=36 187.68

A four-way univariate analysis of variance showed that there are significant differences between experimental and control groups over the three year period ($F = 9.43$; $p < .01$)

*Scores have been standardized, and multiplied by 100.

Table 1

S-B IQ: Wave (1-4) x Treatment (E/C_{SS}) x Test Period (P/P₁/P₂).
Analysis of variance with repeated measures, unweighted means
solution.

Source	SS	df	MS	
<u>Between S's</u>		204		
A (Wave)	1354.84	3	451.61	1.26
B (Treatment)	2036.15	1	2036.15	5.70 ^a
AB	210.20	3	70.07	< 1.00
Ss within grps.	70353.22	197	357.12	
<u>Within S's</u>		410		
C (Test Period)	1512.57	2	756.29	16.36 ^b
AC	786.41	6	131.07	2.84 ^c
BC	869.73	2	434.87	9.41
ABC	637.75	6	100.29	2.30 ^c
CxS's within grps.	18212.35	394	46.22	

^aF_{1, 200} (.95) = 3.89 (E group significantly higher than C_{SS}.)

F_{1, 200} (.99) = 6.76

^bF_{2, 400} (.99) = 4.66 (Significant improvement over time.)

^cF_{6, 400} (.95) = 2.12 (Significant interaction of Wave and Test Period.)

F_{6, 400} (.99) = 2.85

Table 2

PPVT IQ: Wave (1-4) x Treatment (E/C_{SS}) x Test Period (P/P₁/P₂).
Analysis of variance with repeated measures, unweighted means
 solution.

Source	SS	df	MS	F
<u>Between S's</u>		211		
A (Wave)	708.71	3	236.24	<1.00
B (Treatment)	8097.72	1	8097.42	14.39 ^a
AB	2345.36	3	781.79	1.38
S's within grps.	114788.41	204	562.68	
<u>Within S's</u>		424		
C (Test Period)	15744.01	2	7872.01	60.83 ^b
AC	676.53	6	112.76	< 1.00
BC	2666.29	2	1333.15	10.30 ^b
ABC	376.40	6	62.73	< 1.00
CxS's within grps.	52805.15	408	129.42	

^aF.99 (1, 200) = 6.76 (E groups significantly higher than C_{SS}.)

^bF.99 (2, ∞) = 4.61 (Significant improvement over time; significant interaction of Treatment and Test Period.)

Table 3

Summary Table for the Analysis of Variance of Total ITPA Scores
for Wave 1 E and C_{SS} Males and Females from Two Schools, over Three
Years of Testing.

Source	SS	df	MS	F	P
Total	2741029.57895	227			
Between Ss	2330709.39792	75			
A (Treatment)	272766.79629	1	272766.79629	9.43	<.01 ^a
B (School)	20520.82225	1	20520.82225	<1	
C (Sex)	8439.98762	1	8439.98762	<1	
AB	11587.06879	1	11587.06879	<1	
AC	3596.97031	1	3596.97031	<1	
BC	2667.54975	1	2667.54975	<1	
ABC	44181.02175	1	44181.02175	1.53	
Subj w grp (E1)	1966949.18116	68	28925.72325		
Within Ss	410320.18103	152			
D (Year)	3707.58038	2	1853.79019	<1	
Subj x D	406612.60065	150			
AD	15075.11267	2	7537.55633	2.76	
BD	965.49127	2	482.74563	<1	
CD	2563.16404	2	1281.58202	<1	
ABD	667.48691	2	333.74345	<1	
ACD	1349.31028	2	674.65514	<1	
BCD	7632.70753	2	3816.35376	1.40	
ABCD	7427.66053	2	3713.83026	1.36	
Subj x D w grp (E2)	370931.66742	136	2727.43873		

^a E group significantly higher than C_{SS}.

APPENDIX

Institute for Developmental Studies and	City University of New York
School of Education	School of Education
New York University	City College

The Relationship Between Initial and Final
Consonants in a Bi-Positionally Balanced, Paired
Speech-Sound Test: A Discrimination or
Set Problem for Disadvantaged Children?

Allan R. Collier, Richard Coleman, and Sol Schwartz

July, 1967

A WORKING DRAFT

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3

Auditory discrimination (phonetic identification; phonemic, word, sound, or speech-sound discrimination) has been found to be related to both reading and speech performance by Wepman (1960) and by Christine and Christine (1964). Other investigators have chosen to study the relationship between auditory discrimination (AD) and reading, or between AD and articulation skills. Harrington and Durrell (1955) and Katz and Deutsch (1963) have found significant relationships between AD and reading. Travis and Rasmus (1963), Reid (1947), Anderson (1949), Kronvall and Diehl (1954), Scheifelbush and Lindsey (1958), Ayer (1960), Farquhar (1961), Cohen and Diehl (1963), Kronvall (1966) and Lichtenberg (1966) all have found significant relationships between AD and articulatory performance. However, findings by Hall (1938), Hansen (1944), Mase (1946), Reynolds (1953), Wheeler and Wheeler (1954), Lutterman (1960), Sommers (1962), Prins (1963), and by Aungst and Frich (1964) appear to be incompatible with the findings of the previously mentioned investigators. It should be evident that the relationship between auditory discrimination ability and reading and speech performance is neither perfect nor simple.

The occurrence of so many contradictory findings has prompted Russell and Fea (1963) to suggest that: "It may be that different investigators are exploring different elements of auditory discrimination (p. 873)." This latter interpretation is partially supported by Collier (1967) in his attempt to classify speech-sound tests. Collier found that at least five major task-based categories were needed to classify such tests. It appears unlikely that the five

different types of tests measure identical auditory behaviors. Indeed, when Aungst and Frick compared tests from two of the categories, they obtained low negative correlations.

One of the more widely used AD tests is the Wepman Auditory Discrimination Test (WADT) developed by Wepman (1958). The WADT is a bi-positionally balanced, paired speech-sound test, in which each pair of speech-sounds to be distinguished occurs once in the beginning of a pair of words, and once at the end of another pair of words. The WADT has two equated forms and both are traditionally scored by summing up the total number of incorrect responses (an error score) for all those word pairs which are phonemically different. However, exploratory investigations (of Form I) conducted by Collier (1965a); Collier (1965b); Collier, Schwartz, and Coleman (1965); Schwartz and Collier (1965); and by Schwartz, Collier, and Coleman (1965)¹ suggest that this total score may be made up of heterogeneous components. Subjects typically obtain (within the ceiling effects of the test) higher "correct" scores for the set of word-pairs with a phonemic change in the initial position than for those words with a phonemic change in the final position.

The present study was designed to replicate, extend (by examining both forms) and explain the findings of these earlier exploratory studies.² Specifically, it was predicted that we would obtain

1. The exploratory studies mentioned above are reported in Institute for Developmental Studies Research Reports. There are limited quantities available.
2. We wish to express our appreciation to J. Gorrell, A. Luckett, M. McArdle, P. Schneider, S. Tehan and H. Tilis for assisting us in this study.

essentially the same results as mentioned above, but without the difficulties attendant upon post-hoc speculation and that there would not be any statistically significant effects for sex or form, or their interaction.

METHOD

SUBJECTS

The subjects for this study were selected from the first grade populations of four schools located in the Harlem area of New York City.³ The subjects were 128 English speaking, Negro boys and girls whose parents were classified as belonging to the lowest socioeconomic status (SES) groups. SES is based upon an equally-weighted combination of educational and occupational status of the family's main support, and is determined from the Index of SES, developed at the Institute for Developmental Studies. In all cases, the children who participated in this study did so with parental permission.

This particular population was chosen for study because WADT data from one of the exploratory studies -- with a similar population, but with a considerably smaller sample -- did not support our predictions. In addition, recent reports by Deutsch (1963) and by Clark and Richards (1966) have indicated that disadvantaged children have poorer "auditory discrimination," as measured by WADT, than do non-disadvantaged children. We felt that further exploration of AD

3. We would like to thank the New York City Board of Education for permission to conduct this study. In particular, we would like to thank Dr. E. Shapiro of P.S. 92, Mr. Weinstein of P.S. 180, Mr. R.L. Kahn of P.S. 154, and Mrs. Cohen of P.S. 124.

ability in such children would be an important contribution to the understanding of the effects of "disadvantages."

The Wepman Auditory Discrimination Test is a carefully constructed test consisting of two equated forms. Each of the forms contains forty word-pairs; word-pairs used in one form do not occur in the other form. In each form there are thirty pairs of words which differ by a single phoneme and ten pairs which do not differ. S is asked to listen to each of the forty word pairs and to indicate whether each pair is the "same" (the same word repeated), or "different" (two different words).

The thirty "different" word pairs which make up what we call the Total Different Test (TDT) differ from one another in either the initial or final consonants (e.g., pool-tool, shot-shop), or in the medial vowel (e.g., pet-pit). The thirteen word pairs which differ from each other only by an initial consonant-phoneme change we call the Initial Phoneme Test (IPT). The thirteen word pairs which differ from each other only by a final consonant-phoneme change, we call Final Phoneme Test (FPT). The remaining four word pairs which differ from each other only by a medial vowel-phoneme change, we call the Medial Phoneme Test (MPT).

The twenty-six word-pairs differing in either the initial or final consonant positions have been carefully combined. The phonemes to be compared and distinguished belong to the same phonetic category. No cross-phonetic category matching was done. For example, voiced stops are only combined with other voiced stops, and never with an unvoiced stop or nasal, etc. In all, the WADT con-

tains thirteen different phonemic combinations: (1) three voiced stops (g-b, d-b, g-d), (2) three unvoiced stops (k-p, t-p, k-t), (3) one voiced fricative (V-ð), (4) five unvoiced fricatives (f-θ, f-s, s-θ, s-ʃ, θ-ʃ), and (5) one nasal (m-n). Each of the thirteen different phonemic combinations occurs once in the initial position and once in the final position. For example, in Form II, the unvoiced stop combination of the "t-p" occurs once in the initial position (in the word-pair "tin-pin") and once in the final position (in the word-pair "cat-cap). This bi-positional balance control is identical for both forms of the WADT.

The WADT is typically scored by counting the number of times S indicates that word-pairs are the "same" when, in fact, they are different. This latter procedure leads to an "error" score. Failure to indicate that word-pairs are the "same" when they are the same is used to check for response sets or for inattention to the task. Wepman (1958) indicates that protocols showing sixteen or more errors for "different" pairs, or four or more errors for "same" pairs should be put aside as invalid. He claims that "Children with scores in this range are thought to have either a hearing defect, or such poor motivation that they did not follow instructions. Children of lower intelligence, or occasionally those with very poor discrimination, will also make scores in this range (p. 2)". However, it should be noted that lower SES urban Negro children were not included in Wepman's standardization population, so that norms for this group are not available.

INSTRUMENTATION

Recording of the Material. Both forms of the WADT, including instructions, were recorded in a soundproof recording studio. Each form was recorded on an individual tape.

The following recording criteria were observed: (1) that the loudness of each word of a pair should not be substantially different from the other, (2) that the loudness between pairs should not be substantially different, (3) that the presentation time between the words of a pair should be constant throughout all the pairs, (4) that the presentation time between pairs should be constant throughout all the pairs, and (5) that the final part of each word should be emphasized to compensate for the linguistic tendency to lower the voice at the end of words.

Playback. The tapes were played at a constant auditory level on a Tanburg 74B tape recorder. The children listened to the tapes through earphones with the volume indicator set at a point beyond that of ordinary conversation.

ADMINISTRATION OF THE TEST MATERIALS

The test materials were administered in a room free from distractions. To put the child at ease, E explained the purposes for various pieces of equipment. The child was told that he would wear earphones just like an astronaut, and would be told what to do by a voice coming from the earphones. The child was also told that he was going to listen to words and that he would have to listen very carefully. After the child listened to the instructions over the

earphones, E asked the child if he understood what he was to do. In cases where there was doubt, E provided the child with additional sample pairs.

The presentation of the WADT tape took about twelve minutes. Half of the 128 children listened to Form I and half listened to Form II. An equal number of boys and girls listened to each of the forms. If for any reason a child could not be tested, a substitute was assigned to his place.

The criteria set by Wepman for treating protocols as invalid were not followed in this investigation. The following criteria were used instead: (1) fewer than six correct on the "same" test, or (2) fewer than eight correct on the "total different" test, and more than eight correct on the "same" test. These are much more lenient criteria than those set by Wepman. Almost a third of the sample would have failed to meet the criterion of more than fifteen "total different" test pairs correct. In the absence of norms for lower SES urban Negro children, we felt that the original criteria would unduly penalize our subjects.

RESULTS

The data from this study were evaluated by means of a three-way analysis of variance, with repeated measurements on each of the subjects (since each S received a score for the IPT and a score for the FPT).

TABLE I. Analysis of Variance of IPT and FPT Scores

<u>Source of Variation</u>	df	MS	F	p
<u>Between S's:</u>				
(A) Sex (Boys vs. Girls)	1	14.06	1.27	N.S.
(B) Form (I vs. II)	1	9.00	<1	N.S.
(AB) Sex x Form	1	0.99	<1	N.S.
Error bet. S's	124	11.03	--	--
<u>Within S's:</u>				
(C) Test (IPT vs. FPT)	1	138.06	39.90	<.001
(AC) Sex x Test	1	1.56	<1	N.S.
(BC) Form x Test	1	0.56	<1	N.S.
(ABC) Sex x Form x Test	1	7.57	2.19	N.S.
Error within S's	124	3.46	--	--

From Table I we see that there were no significant main effects for Sex or Form, indicating that the performance of the boys and girls was essentially the same, and that the claim that Forms I & II of the WADT are equivalent was partially substantiated. In addition, there were no significant interaction effects.

The statistically significant main effect for Test ($p < .001$) indicates that the children's scores on the IPT and FPT differ significantly from each other. Examination of the means (see Table II) shows that our major hypothesis was substantiated; children obtained higher correct scores on the IPT than on the FPT.

TABLE II. Means and Standard Deviations
of WADT Scores *

		FORM I		FORM II	
		IPT	FPT	IPT	FPT
Boys	$\bar{x}$	10.38	8.31	10.44	9.25
	S.D	2.47	3.21	1.69	2.94
Girls	$\bar{x}$	10.47	9.41	10.97	9.41
	S.D	2.12	3.15	1.81	3.25

* n = 128: 64 boys and 64 girls

DISCUSSION

The results of this investigation are very clear: the disadvantaged children of this study obtained significantly higher scores on the IPT than on the FPT. Further, there was no difference between Form I or Form II. This latter result bolsters our earlier findings, suggesting that the differences we originally found were not due to some idiosyncratic feature of Form I.

The significant difference between the IPT and FPT indicates that the TDT score of the WADT is composed of at least two different tests. In this study, the TDT score is disproportionately influenced by error contributed by the FPT. It is not inconceivable that a child may do well on the IPT and poorly on the FPT, thereby confounding the meaning of the TDT score. An example of one such case is that of Robert. Robert's protocol is unique in its extremeness, but the relationship between the IPT and FPT scores is by no means unusual. Robert missed all 4 of the MPT items and 12 of the 13

FPT items. The combined MPT and FPT error score adds up to 16 -- Wepman's criterion for invalid WADT protocols. Nevertheless, Robert obtained a perfect score on the IPT. This was not a chance finding, for when Robert was tested the next day, he again obtained a perfect score on the IPT, missed all 4 MPT items, and missed all but 2 of the 13 FPT items.

Compare Robert's performance with that of Jimmy, who also missed a total of 16 items. Jimmy missed 5 IPT items, 4 MPT items, and 7 FPT items. It should be obvious that these two protocols reflect different orders of performance. Robert's protocol places us in somewhat of a dilemma. On the one hand, we may conclude that Robert has excellent AD ability -- a perfect score on the IPT. Indeed, of the entire sample of 128 children tested, only 3 children, Robert included, obtained a perfect score on the IPT. On the other hand, we may conclude that Robert has very poor AD ability -- his near total failure of the FPT. However, if we merely look at the TDT score, we must treat both Robert's and Jimmy's protocols as invalid. The conclusion that they both have poor AD ability would have to ignore the obvious pattern differences that distinguish their protocols.

It would be difficult to conclude that Robert was poorly motivated, since this motivation would have to be differentially applied to the beginnings and endings of words. Nor can we apply a criterion of low intelligence to this differential performance. The postulation of some sort of differential hearing defect would be unparsimonious, to say the least. The issue, then, is whether we are

measuring AD per se or whether S's response involves something else.

Results similar to those found in this study have been found by other investigators, using paired speech-sound tests with less adequate bi-positional balance. The traditional way in which these investigators have interpreted their results has been to assume that phonemic differences are more difficult to distinguish when they occur in the final part of words. For example, Templin (1943) carried out a study "to determine whether there was any variation in the ability of children to discriminate between identical and unlike syllables when the position of the discriminative element changed from the initial to the medial or final position (p. 129)." She concluded that "there is a real difference produced in the scores made on a sound discrimination test when the discriminative element is changed from the initial to the medial or final positions. The children in all grades made more errors when the consonant or combination was in the medial or final position (p. 131)." In another study, Pronovost and Dumbleton (1953) concluded that "the findings ... agreed with the generally accepted idea that sounds are discriminated with more difficulty when in the final position than when in the initial position (p. 262)."

In order to accept these latter conclusions one must also believe that it is possible for S to correctly discriminate between, say, the phonemes p-t, when they occur at the beginning of words, but not when they occur at the end of words. What would account for such a phenomenon? As far as can be determined, the only AD-like explanation for the above would be the linguistic tendency for final

sounds to be articulated with less loudness than the initial sounds. This explanation may be dismissed for this study, since the final parts of the word-pairs were especially articulated to control for just such a possibility.

It should be understood that until the mechanisms responsible for such a phenomenon are specified, one must approach such conclusions with caution. To interpret any type of response on the WADT as a measure of AD ability requires that the effective stimulus for S be the two phonemes that differ from one another. If we cannot determine this, we cannot meaningfully conclude that S has either good or poor AD ability. Thus, Robert's performance could be interpreted as demonstrating that he did not treat the final parts of the word-pairs as effective stimuli. Unfortunately, from the available data we cannot determine whether Robert merely "tuned-out" (i.e., that he did not hear the endings), or simply did not respond to differences that he did, in fact, hear.

Robert's perfect performance on the IPT suggests that he was treating the initial parts of the word-pairs as the effective stimuli; that he was responding to phonemic differences that occur at the beginnings of words. If, in fact, he was carrying over this skill to FPT items, where initial phonemes are identical, we would expect his FPT score to be very low. Thus, his AD ability may be very good, but by responding to an aspect of the stimulus different from what E expects, he achieves a low score.

Any interpretation of AD ability based solely upon the TDT score of the WADT must ignore such a possibility and is therefore

descriptively incomplete. On the basis of our findings and their interpretation, we strongly urge that the TDT score of the WADT, or of any similar test of AD ability be broken down into its component parts and subjected to a pattern-analysis.

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Relationship of Conservation Explanations to Item Difficulty

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July, 1967

A WORKING DRAFT

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Piaget views the development of intellectual functioning as a progression of discontinuous, qualitatively different stages. Each stage is achieved through the reorganization of existing internal cognitive structures as the consequence of interaction between the organism and the environment. According to Piaget, around the age of seven, the child enters the stage of "concrete logical operation." He becomes capable of performing certain logical operations, provided that these operations involve concrete objects or an immediately present reality. Evidence of the attainment of the stage of concrete operations is the ability of the child to conserve, e.g., recognize that the number of blocks is maintained or that a ball of plasticene continues to be the same weight or volume despite rearrangements of such materials.

The child's ability to conserve, that is to recognize the constancy of physical attributes of objects, has been measured by several different verbal techniques, either singly or in combination, e.g., "prediction" -- the child's anticipation as to the result of a displacement; "choice" -- the child's judgment regarding the physical characteristic after a displacement of materials, and finally the "explanation" given for the child's "prediction" or "choice."

Investigators have debated the relevance of "explanation" as a measure of children's understanding of the principle of conservation. Smedslund (1961) following Piaget (1952), holds that an appropriate explanation is essential as evidence of conservation. In contrast, Braine (1959) argues that inappropriate explanation is merely an indication of the child's lack of verbal skills rather

than the absence of logical operations. Although "explanation" has been found to be a more stringent criterion that is reflective of age (Gruen, 1966; Pratoomraj and Johnson, 1966), previous findings have not indicated a clear-cut relationship between making a conservation response and the explanation offered by the child for his judgment.

Almy (1966) found that the explanation most frequently given for both conservation and nonconservation of number (blocks) referred to the displacement of the materials, e.g. "they're spread out." Children, in justification of their responses to conservation of liquid tasks, predominantly referred to the dimensions of the containers. According to Bruner (1966), all explanations fall into one of three categories; nonconservation responses are supported by "perceptual" explanations and conservation responses are associated with "identity" or "conflict" explanations. However, examination of the specific responses classified under these headings reveals considerable overlap among the categories.

If explanations actually reflect different levels of comprehension of the concept of conservation, the frequency of different types of explanations should vary with the difficulty level of the item. For example, as item difficulty increases one would expect an increase of perceptual explanations accompanied by a decrease of explanations based on an addition-subtraction principle. Finding this type of relationship based on an intrinsic variable such as item difficulty, rather than a more external and possibly irrelevant variable such as age, would be substantial evidence of the integral

relevance of the explanation to comprehension of conservation.

The frequency of various explanations of 180 children classified by grade, socioeconomic status (SES) and conservation "choice" score, were examined in relationship to the difficulty level of seven conservation items.

Subjects

The sample consisted of 180 lower and middle SES, white kindergarten, first and second grade pupils attending four New York City public schools, three located in Queens, one in lower Manhattan. Each SES by grade cell of the sample contained 30 subjects, 15 boys and 15 girls, for the total of 180 subjects representing two SES levels and three grades. SES classification was based on the occupation and education of the child's main support, as reported in a questionnaire completed by the child's parents (with the exception of some twenty lower class children who were selected from the free milk and lunch list in one of the Queens Schools). It was later learned that some of these children were siblings of children selected for inclusion in the sample on the basis of the questionnaire. For those cells in which the number of available subjects exceeded the number required, subjects were randomly assigned. All the children had been granted permission by their parents to participate in the study.

Conservation Score

According to Piaget (1952) conservation is exhibited first in the conservation of discontinuous and then of continuous quantity.

The following materials were therefore selected to evaluate a continuum of conservation of quantity ranging from materials consisting of obviously discrete units to a substance in which the individual particles were completely invisible.

a) Small numbers of blocks (countable -- ten in each of two rows, or ten in one row and seven in the other row).

b) A crystalline substance consisting of minute particles (salt).

c) Water.

Zimiles (1965) has noted that conservation has predominantly been studied under the condition he calls "equivalent." Two equal numbers of objects or amounts of a substance are presented so that the equality is perceptually evident. One is then reoriented so that the equality of the two is no longer visually apparent. Zimiles also studied conservation of discontinuous quantity under the condition he calls "different." In the latter case, two unequal numbers of objects are presented so that the inequality of number is perceptually obvious. One set of objects is then rearranged so that the inequality of the two sets of objects is no longer visually evident. Although Zimiles hypothesized that the different condition should be easier, he found that these two conditions were of equal difficulty. All the conservation tasks were presented under the following variations of the equivalent-different condition:

a) Equal in number or amount -- Unequal perceptually,

b) Unequal in number or amount -- Greater number or amount

perceptually equal to lesser number or amount.

c) Unequal in number or amount -- Lesser number or amount perceptually more than greater number or amount.

Taking all meaningful variations of the materials and conditions (equivalent, different) resulted in the following nine items:

a) Two rows of 10 blocks, one row rearranged by bunching.

b) One row of 7 blocks, one row of 10 blocks, the row of seven blocks spread out so that endpoints of the two were parallel.

c) One row of 7 blocks, one row of 10 blocks, the 7-block row spread to a greater length than the 10-block row.

d) Two measuring cups containing equal amounts of salt, the salt in one cup poured into a shallow bowl.

e) Two measuring cups, one cup containing eight ounces of salt, one cup containing five ounces of salt, the smaller amount of salt poured into a taller, thinner glass so that the heights of the two amounts of salt were the same.

f) Two measuring cups, one cup containing eight ounces of salt, one cup containing five ounces of salt, the smaller amount of salt poured into a taller, thinner glass so that the smaller amount of salt rose to a greater height than the larger amount of salt.

g) Two measuring cups containing equal amounts of water, the water in one cup poured into a shallow bowl.

h) Two measuring cups, one cup containing eight ounces of water, one cup containing five ounces of water, the smaller amount of water poured into a taller, thinner glass so that the heights of the two amounts of water were the same.

i) Two measuring cups, one cup containing eight ounces of water, one cup containing five ounces of water, the smaller amount of water poured into a taller, thinner glass so that the smaller amount of water rose to a greater height than the larger amount of water.

Prior to administration of the nine conservation items, each subject was run through an orienting session designed to induce a set to respond to the question. "How about now?" This preliminary session was included to avoid the giving of cue-bearing words (more, less, the same) for each test question. Only if the subject did not respond to the question "How about now?", was a probe containing the specific quantity words used? Each item was scored as follows.

0 -- Nonconservation response, or no answer,

1 -- A conservation response after the experimenter probed, that is, stated the alternatives for the subject,

2 -- A conservation response, without probe, to the question "How about now?"

Children's Explanations

The children's explanations were classified into the following six categories:

1 - Classical conservation-type response, reference to the previous condition of the materials or an addition-subtraction explanation, e.g., "you didn't take any away or put any in,"

2 - Counting,

3 - Combination of conservation-type explanations with dimen-

sional description of the length or width of a display of discontinuous materials or the containers for the continuous materials,

4 - Displacement explanations, e.g., "You poured the water,"

5 - Dimensional descriptions,

6 - No response, or repetition of the experimenter's words.

Conservation Item Difficulty

By rank-ordering the nine conservation items it was found that generally, across and within all grades the block items were the easiest, and the salt and water items rather more difficult. Therefore, all responses for the three block items were grouped together as explanations for less difficult items, and responses for the salt and water items were grouped together as explanations for the more difficult items.

Two items were excluded from the analysis. The two salt and water items which were unequal but made to appear equal, theoretically belonged with the more difficult materials. However, empirically they were the least difficult items. Since the heights of the contents in the measuring cup and the glass were equal, it may be that many of the children based their correct responses on the perceptual difference in size of the respective diameters. However, if this was the case, it was not revealed in the explanations given by the children. The more frequent explanation given by children who conserved only on these continuous items was a reference to the false bottom in the glass, which was made particularly evident during the administration of the salt item by the contrast in color between the salt and the glass. Because of the contradiction between

empirical and theoretical difficulty, it did not seem appropriate to include responses to these items in either category, although preliminary examination of the actual distribution of explanations suggested that they belonged with the more difficult items. Therefore, the more difficult items included only four instead of all six salt and water items.

Results and Conclusions

For any given item, a score of two indicated that a child conserved without probing; 1, that the child conserved but only after a probe stating the alternatives had been administered; 0, that the child did not conserve. Tables 1 and 2 show the distribution by explanation category of all the responses given in connection with each score, 0, 1, or 2, for both the less and more difficult items. Figures 1 through 6 illustrate this data graphically.

Table 1

Distribution of Conservation Explanations by
Conservation Score, Difficulty Level of the
Items, and Grade

<u>Score</u>										

Kindergarten

Cons.	5	8	0	0	9	41	1	20	19	40	10	26
Counting	1	2	0	0	2	9	0	0	6	13	0	0
Cons&Dim	0	0	1	1	2	9	0	0	1	2	3	8
Displace	23	38	17	16	3	14	0	0	15	31	1	3
Dimen	17	28	72	69	5	23	4	80	6	13	24	62
None/Rep	14	23	14	13	1	5	0	0	1	2	1	3

1st Grade

Cons.	6	9	1	1	11	58	4	31	40	43	44	57
Counting	0	0	0	0	2	11	0	0	6	6	--	0
Cons&Dim	0	0	4	3	1	5	2	15	0	0	4	5
Displace	43	63	5	3	1	5	1	8	30	32	5	6
Dimen	17	25	138	90	2	11	6	46	16	17	22	29
None/Rep	2	3	5	3	2	11	0	0	1	1	2	3

2nd Grade

Cons.	1	4	1	1	9	60	8	67	78	56	90	59
Counting	1	4	0	0	1	7	0	0	7	5	0	0
Cons&Dim	0	0	2	3	1	7	1	8	3	2	20	13
Displace	15	58	2	3	2	13	0	0	32	23	11	7
Dimen	7	26	67	89	0	0	2	17	18	13	31	20
None/Rep	2	8	3	4	2	13	1	8	1	1	1	1

Table 2

Distribution of Conservation Explanations by
Conservation Score, Difficulty Level of the
Items, and SES Level

Explanations	Score											
	0				1				2			
	Less Diff. Items		More Diff. Items		Less Diff. Items		More Diff. Items		Less Diff. Items		More Diff. Items	
	N	%	N	%	N	%	N	%	N	%	N	%
Low SES												
Cons.	10	8	2	1	15	41	4	24	50	44	45	42
Counting	1	1	0	0	2	6	0	0	9	8	0	0
Cons.&Dim.	0	0	3	1	3	8	2	12	0	0	7	8
Displace	58	48	24	10	5	14	1	6	34	30	11	18
Dimen.	32	27	198	80	6	17	9	52	20	18	26	28
None/Rep.	18	15	21	8	5	14	1	6	0	0	4	4
Middle SES												
Cons.	4	5	2	1	14	74	6	55	87	54	99	58
Counting	1	1	1	1	2	11	0	0	10	6	0	0
Cons.&Dim.	0	0	4	2	0	0	2	18	4	2	18	10
Displace.	43	49	2	1	2	11	0	0	43	27	6	3
Dimen.	31	36	162	93	1	5	3	27	15	9	51	30
None/Rep.	8	9	4	2	0	0	0	0	2	1	0	0
Total												
Cons.	12	8	2	1	29	52	13	44	137	48	134	51
Counting	6	4	0	0	5	9	0	0	19	7	0	0
Cons.&Dim.	0	0	7	2	4	7	3	10	4	1	27	10
Displace.	81	51	24	7	6	11	1	3	80	29	17	7
Dimen.	41	26	277	83	7	12	12	40	40	14	77	30
None/Rep.	18	11	22	7	5	9	1	3	2	1	4	2

KINDERGARTEN

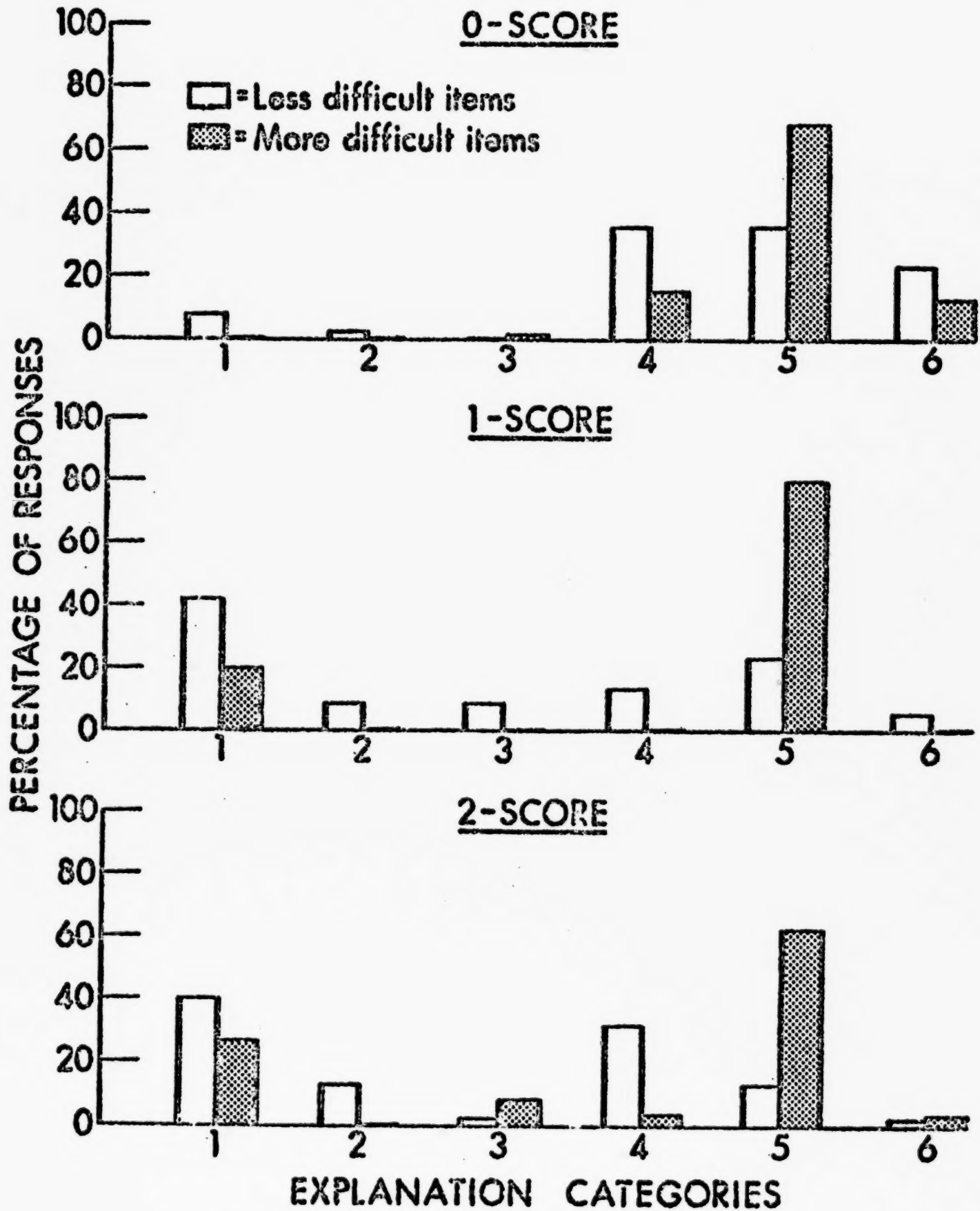


Fig. 1. Percentage distribution of conservation explanations falling in each category by conservation score, kindergarten subjects.

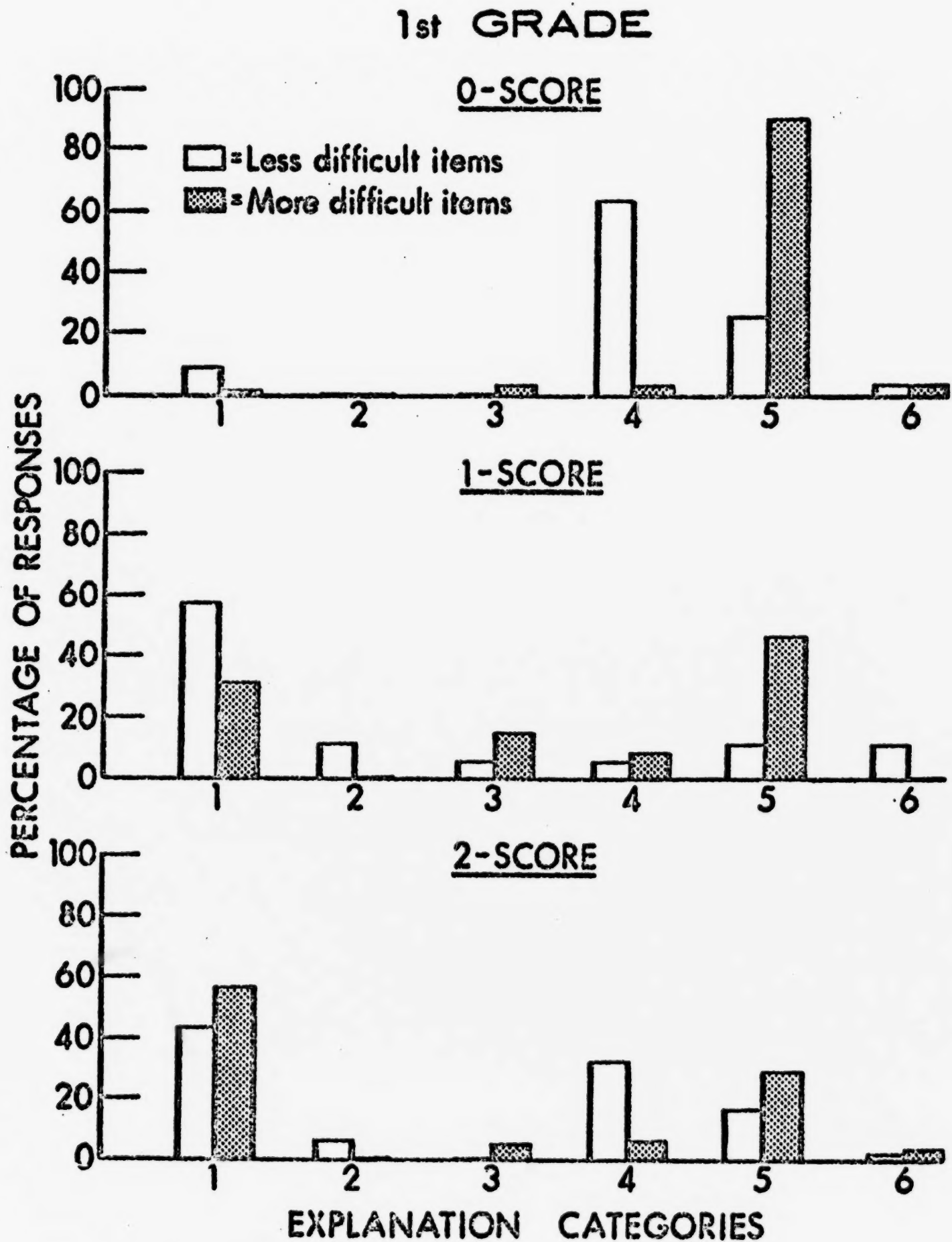


Fig. 2. Percentage distribution of conservation explanations falling in each category by conservation score, first grade subjects.

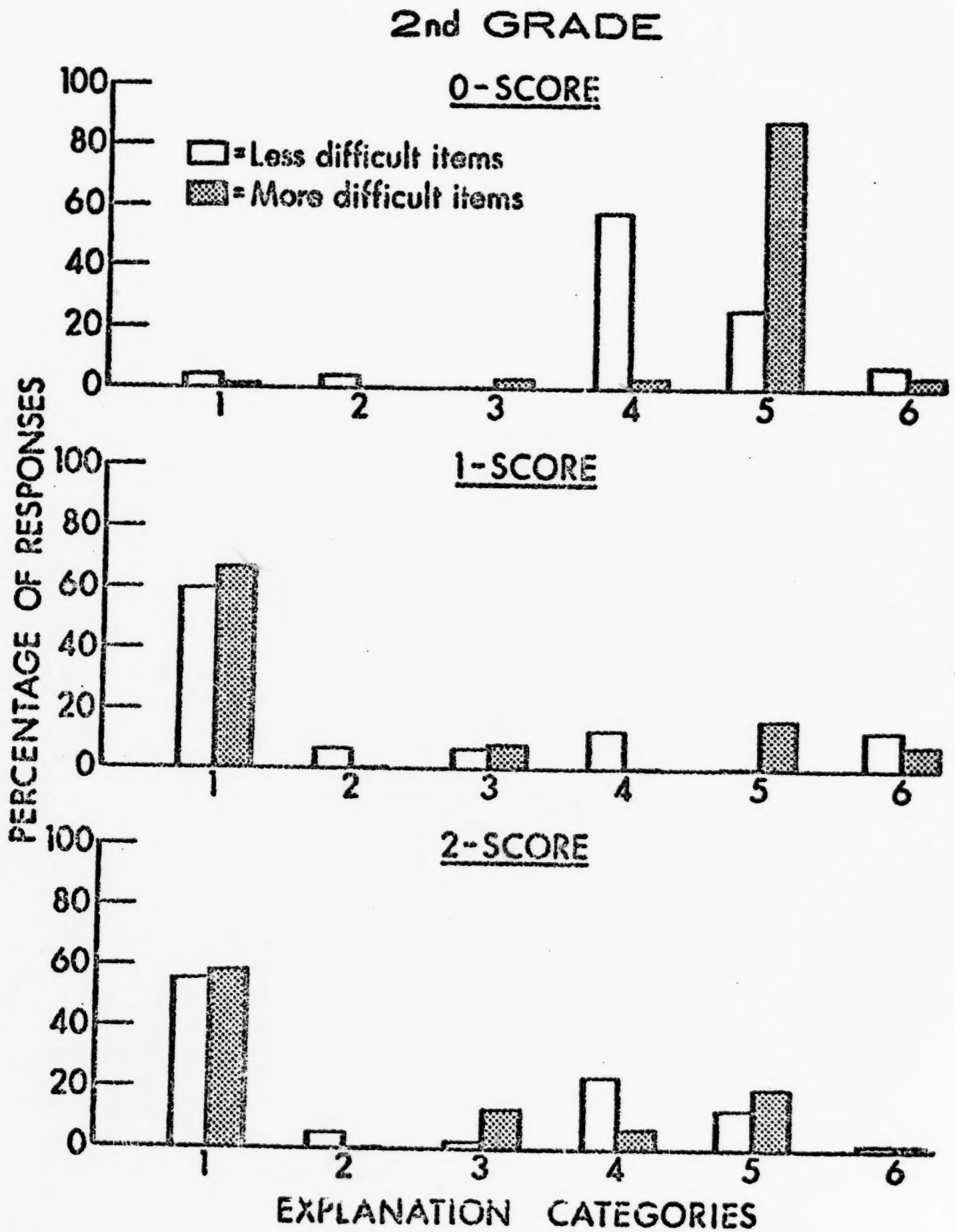


Fig. 3. Percentage distribution of conservation explanations falling in each category by conservation score, second grade subjects.

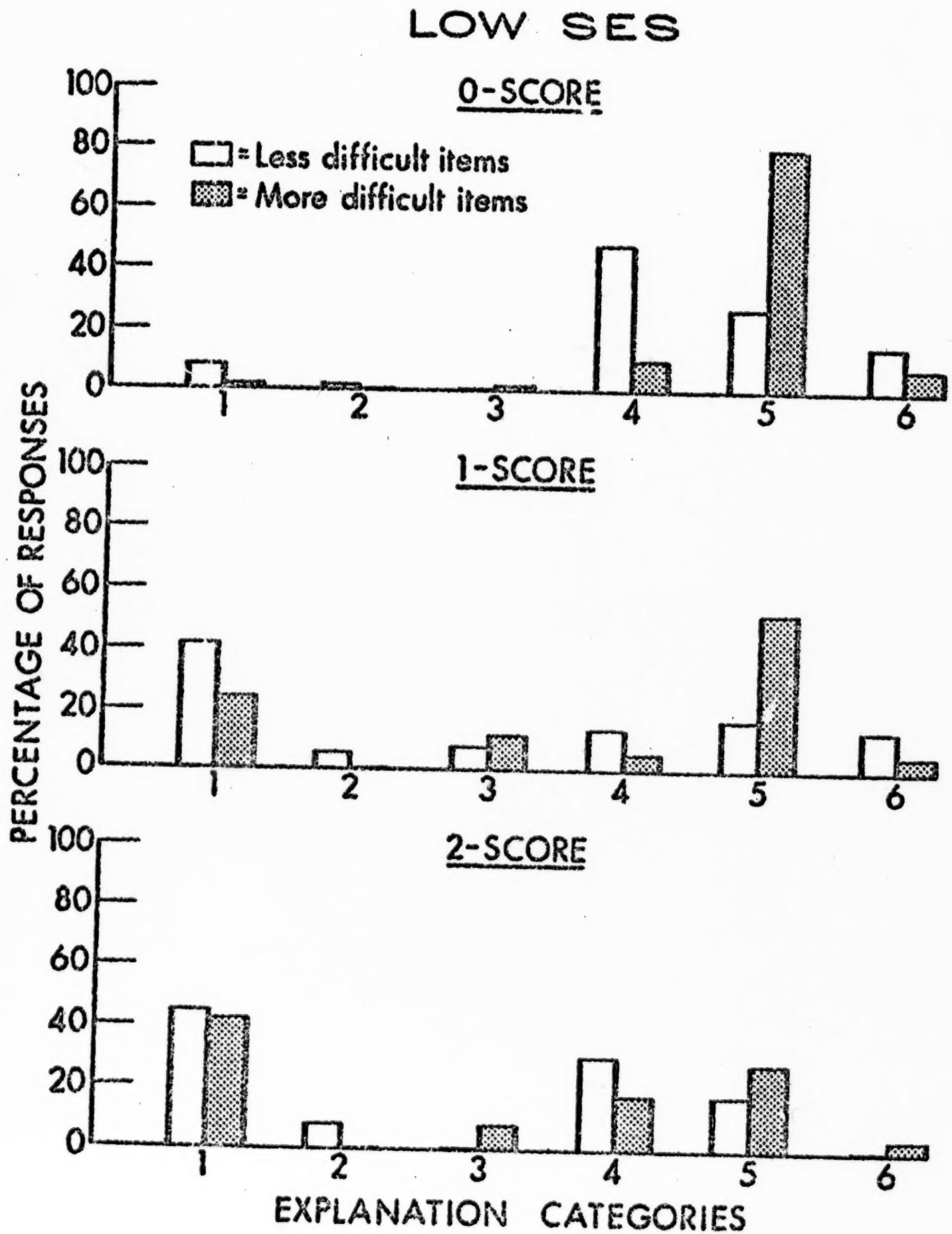


Fig. 4. Percentage distribution of conservation explanations falling in each category by conservation score, low SES subjects.

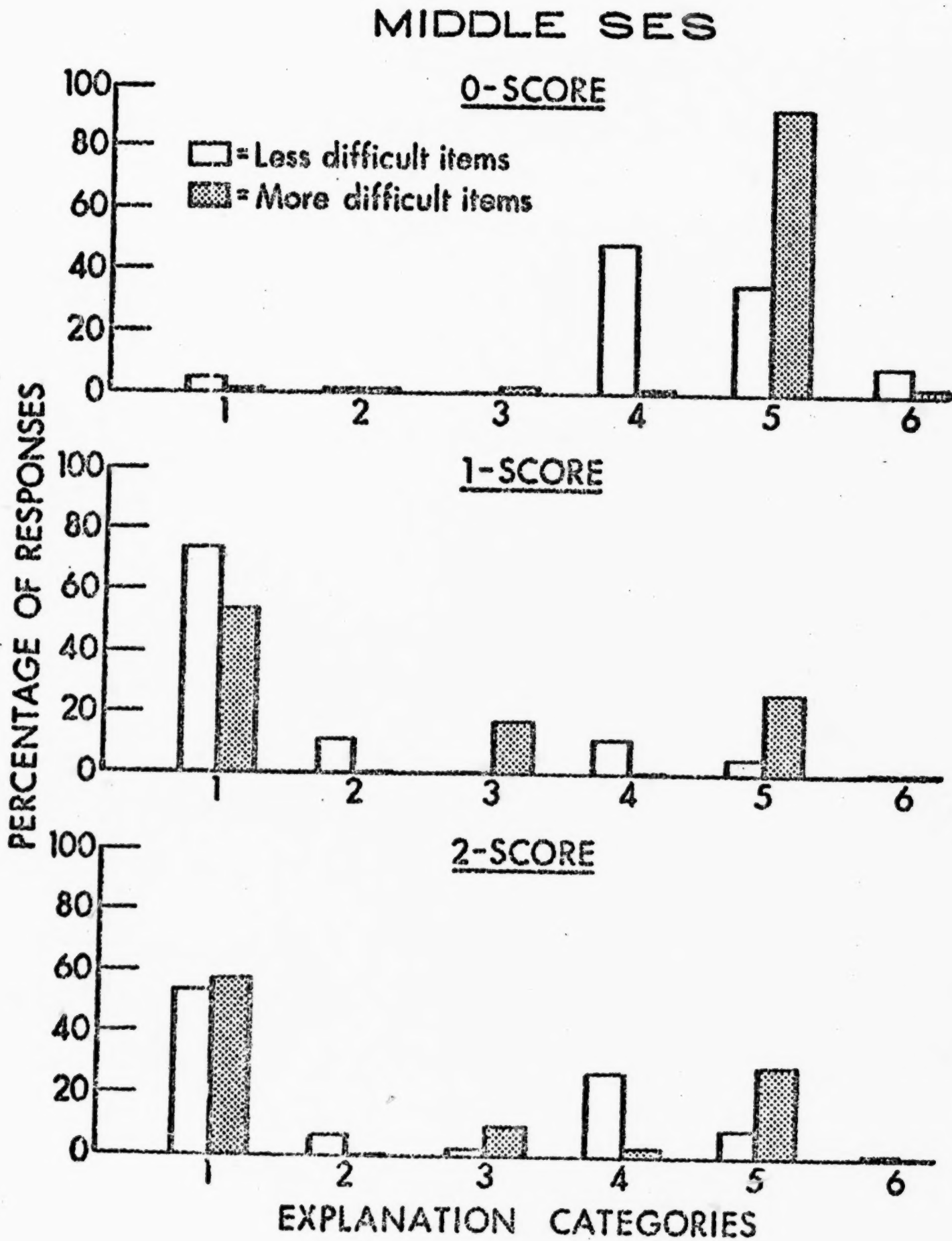


Fig. 5. Percentage distribution of conservation explanations falling in each category by conservation score, middle SES subjects.

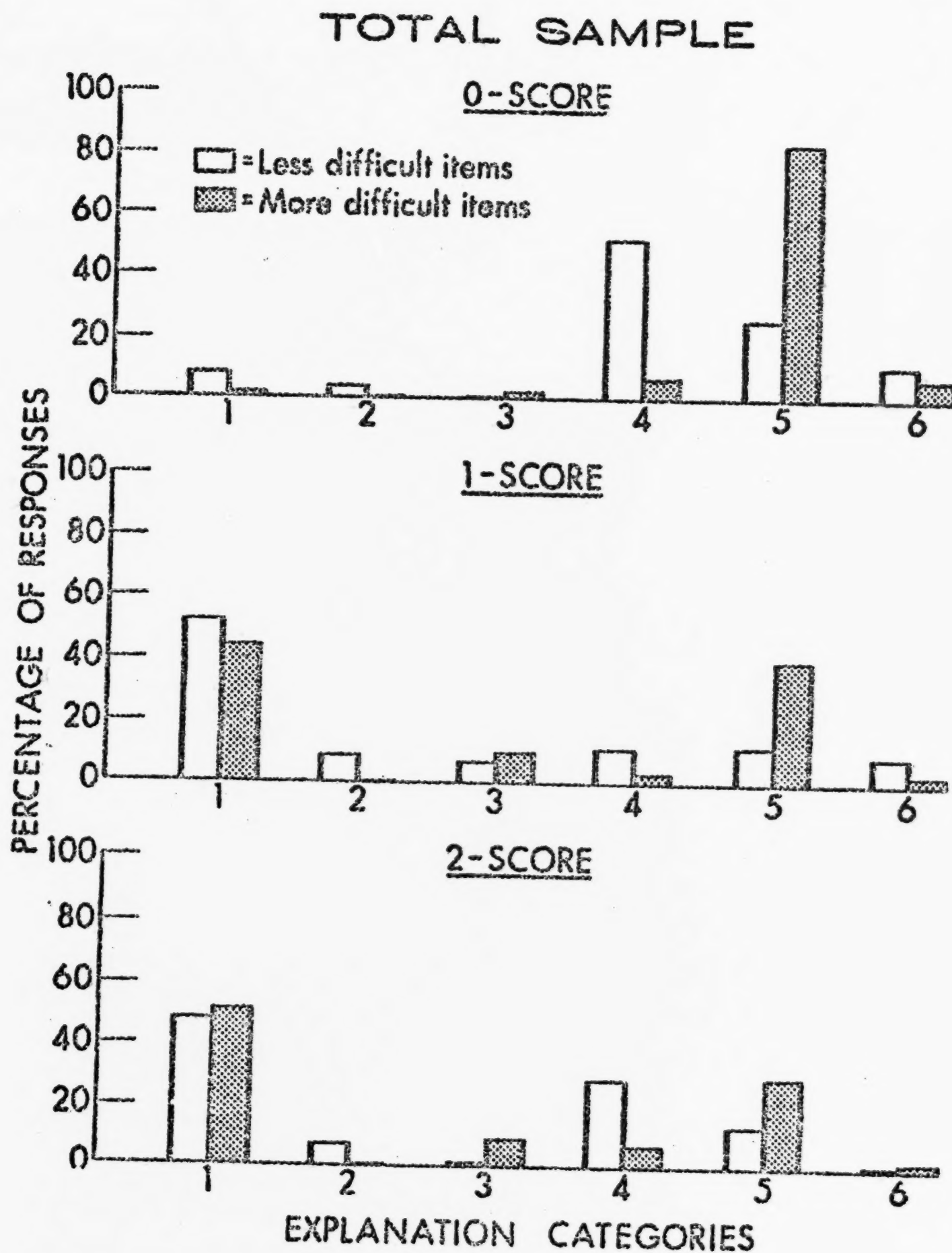


Fig. 6. Percentage distribution of conservation explanations falling in each category by conservation score, all grades combined.

In all grades, for all judgements, conservation-type or non-conservation-type, the more difficult items elicited more dimensional explanations. Ignoring the magnitude of the increase in dimensional responses, which is considerable for most of the distributions, and applying a simple sign test, the probability of increase occurring by chance nine out of nine times is .002.

For conservation-type responses, i.e., 2-scores in the first and second grades and 1-score in second grade, in contrast to the other response-grade subgroups, classical conservation explanations increased slightly. The repetition of nine tasks seemed to afford the older children, who were closer to complete attainment of the concept of conservation, an opportunity to clarify and consolidate their understanding of the task.

The increase in dimensional responses as a function of greater difficulty level of the items was substantially greater than the decrease in conservation-type responses. The category which decreased in eight out of the nine sub-groups ($p = .02$ by the sign test) was "displacement," which included responses such as "they're spread out" or "you poured it."

It is difficult to judge whether the responses in the displacement category reflect the idea of "basic identity" which Bruner (1966) suggests is the carrier of conservation understanding or rather a neutral, noncommittal category. This category, which was a preponderant response for nonconservers on the easier items, did not show clearcut variation as a function of age.

To summarize, the changes in response found relative to the

difficulty level of the items indicate that inability to express cogent reasons for conservation is not merely a function of verbal skills, as has at times been suggested, but rather is reflective of a lower level of conservation conceptualization.

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TIME DISTRIBUTION RECORD (TDR)

Teacher _____ Ass't Teacher _____ Observer _____
School _____ No. of Children _____ Date _____

Summary

	Activity	Time Started	Time Duration	Category	Total Minutes Duration	
					Code	
e.g. -	Removing coats, etc.	9:00	5"	8	Play - 1	55"
	Circle time (recording voices on tape recorders)	9:05	15"	4	Outdoor - 2	35"
	Work & Play Period	9:20	55"	1	Informal Rdg. - 3	12"
	Clean-up time	10:15	11"	8	Circle time - 4	20"

Dismissal 12:00

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LOCATION ACTIVITY MATERIAL INVENTORY (LAMI)

Obs. _____ Date _____

School _____	Materials	Loc.	Soc.
	e.g.- { BO, MT, A, HH, TA, W, TR, DO, F, BL, RE, CL	1. Book C. 2. Tables 3. Sink-Easel 4. Doll C. 5. Shelves 6. Open Area	0 = alone T = tchr C = child

Name	Loc.	Mat.	a	Soc.	m.
------	------	------	---	------	----

a) Column for second material

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TEACHER PLAY PERIOD RATING (TPPR)

Teacher_____ Ass't Teacher_____

Observer_____ School_____ Class_____

No. of Children_____ Date_____ Time_____

Code: Child-teacher interaction (number begin)

1 - Informal Teaching; 2 - Auxiliary help; 3 - Control;
4 - Directs; 5 - Social or Role play; 6 - Inaudible or
Unclassifiable.

Other: (letter begin)

T - teacher-ass't teacher interaction; A - Teacher-other
adult; E - Engages in activity;) - Observes; U - Un-
ratable

	<u>T</u> <u>Time</u>	<u>AT</u> <u>9:48</u>	<u>T</u> <u>Time</u>	<u>AT</u> <u>10:01</u>	<u>T</u> <u>Time</u>	<u>AT</u> <u>10:10</u>
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						

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TEACHER OBSERVATION SCALE (TOS)

Teacher_____ Ass't Teacher_____ Observer_____

School_____ No. of Children_____

Date_____ Time Started_____ Finished_____

Topic_____

CATEGORIES

	<u>No. of Units</u>	<u>Information Given</u>	<u>Eliciting Responses</u>	<u>Feedback to the child</u>	<u>Control</u>
e.g.-	5	5	5	5	5
	10	5	5	5	1
	15	5	5	2	
Total:		15	15	12	6

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CHILD ATTENTION RATING SCALE (CARS)

Obs. _____ Date _____ Time Start _____ End _____

School _____ Grade _____ Teacher _____

Lesson: Story

Key: Appropriate +
Inappropriate -
Unratable U

Intensity of motor activity: None 0
Minimal 1
Gross 2

	<u>ID#</u>	<u>Name</u>	<u>Visual</u>	<u>Verbal</u>	<u>Manipulation</u>		<u>Locomotion</u>		<u>Tot.</u>	<u>Comment</u>
					<u>Int.</u>	<u>App.</u>	<u>Int.</u>	<u>App.</u>		
e.g.-{		David	+	+	0	+	0	+	4	
		Lloyd	+	+	1	-	0	+	3	picking at fingers
		Melvin	+	+	0	+	0	+	4	

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BROWN - IDS SELF CONCEPT REFERENTS TEST

Ident # _____

NAME _____ AGE _____ SEX _____ SCHOOL _____ GRADE _____

TEACHER _____ DATE _____ EXAMINER _____ R _____

INSTRUCTIONS: Examiner presents each descriptive pair in the following list to each child, in conjunction with the picture he has taken of the child (S). S is asked to respond to the same descriptive list four times, indicating his perceptions of self against four criteria, as follows:

- 1) Johnny Gallagher (is)....
- 2) Johnny Gallagher's mother (thinks he is)...
- 3) Johnny Gallagher's teacher (thinks he is)...
- 4) The other kids (think Johnny Gallagher is)...

Johnny Gallagher (is)...

happy _____ -1

sad _____ -0

clean _____ -1

dirty _____ -0

good looking _____ -1

ugly _____ -0

likes to play with other kids _____ -1

doesn't like to play with other kids _____ -0

likes things of his own _____ -1

likes to have other kids' things _____ -0

good _____ -1

bad _____ -0

likes to talk a lot _____ -1

doesn't like to talk a lot _____ -0

smart _____ -1

stupid _____ -0

Johnny Gallagher's mother (thinks he...is...) cont'd

scared of a lot of people _____ -0
 not scared of a lot of people _____ -1

 likes the way his clothes look _____ -1
 doesn't like the way his clothes look _____ -0

 strong _____ -1
 weak _____ -0

 healthy _____ -1
 sick _____ -0

 likes his face _____ -1
 doesn't like his face _____ -0

Johnny Gallagher's teacher (thinks he...is...)

happy _____ -1
 sad _____ -0

 clean _____ -1
 dirty _____ -0

 good looking _____ -1
 ugly _____ -0

 likes to play with other kids _____ -1
 doesn't like to play with other kids _____ -0

 likes things of his own _____ -1
 doesn't like things of his own _____ -0

 good _____ -1
 bad _____ -0

 likes to talk a lot _____ -1
 doesn't like to talk a lot _____ -0

 smart _____ -1
 stupid _____ -0

 scared of a lot of things _____ -0
 not scared of a lot of things _____ -1

Johnny Gallagher's teacher (thinks he...is...) cont'd

scared of a lot of people _____ -0
 not scared of a lot of people _____ -1

 likes the way his clothes look _____ -1
 doesn't like the way his clothes look _____ -0

 strong _____ -1
 weak _____ -0

 healthy _____ -1
 sick _____ -0

 likes his face _____ -1
 doesn't like his face _____ -0

The other kids (think...Johnny Gallagher...is...)

happy _____ -1
 sad _____ -0

 clean _____ -1
 dirty _____ -0

 good looking _____ -1
 ugly _____ -0

 like to play with Johnny Gallagher _____ -1
 don't like to play with Johnny Gallagher _____ -0

 like to have Johnny Gallagher's things _____ -1
 don't like to have Johnny Gallagher's things _____ -0

 good _____ -1
 bad _____ -0

 likes to talk a lot _____ -1
 doesn't like to talk a lot _____ -0

 smart _____ -1
 stupid _____ -0

 scared of a lot of things _____ -0
 not scared of a lot of things _____ -1

Johnny Gallagher (is)... cont'd)

scared of a lot of things_____ -0
not scared of a lot of things_____ -1

scared of a lot of people_____ -0
not scared of a lot of people_____ -1

likes the way his clothes look_____ -1
doesn't like the way his clothes look_____ -0

strong_____ -1
weak_____ -0

healthy_____ -1
sick_____ -0

likes his face_____ -1
doesn't like his face_____ -0

Johnny Gallagher's mother (thinks he...is...)

happy_____ -1
sad_____ -0

clean_____ -1
dirty_____ -0

good looking_____ -1
ugly_____ -0

likes him to play with other kids_____ -1
doesn't like him to play with other kids_____ -0

likes him to have things of his own_____ -1
doesn't like him to have things of his own_____ -0

good_____ -1
bad_____ -0

likes him to talk a lot_____ -1
doesn't like him to talk a lot_____ -0

smart_____ -1
stupid_____ -0

scared of a lot of things_____ -0
not scared of a lot of things_____ -1

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TELEPHONE INTERVIEW - Revised Standard Form

May 1968

1. Hello, what's your name?
2. How are you today, _____?
3. What did you do in school today? (Probe: What did you play with? Tell me about that. What else did you do?)
4. If you could take a trip, where would you go? (Probes: What would you do there? Have you ever been there before? How do you get there? Who took you?)
5. The child will be given an object to hold while the following questions will be asked about it. (Object used in the first interview, bean-bag chicken; second interview, stuffed cow with a bell; third interview, quacking metal duck.)
 - a. Tell me what you think that is.
 - b. Tell me all the colors the _____ has.
 - c. What is the _____ made of?
 - d. When you touch it, how does it feel?
 - e. What do you think is inside?
 - f. When you shake it, how does the _____ sound?
6. What would you like to do next Saturday? (Probes: Did you do that before? How do you do that? Where would you do that?)
7. Tell me _____, what can you do with _____? (Probe: What else can you do with _____? (First interview: water; second interview: paper; third interview: a hand.)
8. For this question, a four picture sequence from the storybook of Curious George will be shown to the child at the same time that the interviewer is asking him questions. He will be asked to "Tell me about what is happening in this picture." (Probes: What else is happening? What else do you see? What else is he doing?)

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TELEPHONE INTERVIEW - Analysis of Language Samples

1. Mean Length of Response - Mean number of words elicited by three questions.

- a) What did you do in school today?
- b) If you could take a trip, where would you go?
- c) What would you like to do next Saturday?

In each case, the score was the number of words given before the examiner's first probe to obtain more information. If the examiner received no immediate response and therefore had to repeat the question, the score was the number of words the child gave when and if he did respond after the question was repeated.

2. Color Knowledge - The child was shown and permitted to handle a different multi-colored toy object in each of the interviews. In the first, it was a felt bean bag chicken; in the last, it was a metal duck on wheels. In each case the child was asked: "What colors do you see?" The score is the number of colors that the child named.

3. Knowledge of Material Use - In the first interview the child was asked: "What can you do with water?" and was probed with "What else can you do with water?" His score is the number of correct uses coded both before and after the probe. In the final interview

he was asked: "What can you do with _____?"

- a) water
- b) paper
- c) a hand

His score for the final interview is the mean number of correct uses cited.

4. Total Verbal Output (TV0) - The total number of words spoken by the child during the entire interview.

5. Type-Token Ratio - A ratio to two decimal places of the number of different words spoken by the child during the entire interview over the total number of words spoken.

6. Number of Objects in Story Pictures - A count of the number of objects and/or people identified by the child in the series of four pictures from a story book which he was shown. If an object appeared in more than one picture, the child received credit for each time he identified it. The question was: "What do you see in the picture?" Probes were: "What else do you see?" "What is happening?"

7. Number of Transitions in the Story Question - Refers to the transitions between pictures in the series of four. The child received credit for either implicit or explicit verbal transition. The maximum number of transitions that could be made is three. This variable was coded in the following manner:

- 0 = no transitions
- 1 = transition between two pictures
- 2 = transitions between three pictures
- 3 = transitions between four pictures

8. Story Structure - A composite score of three separate indicators. For each of the two interviews, the response to each of the four pictures in the series was coded for a) any form of a modifier (adjective or adverb), b) the description of any instance of action of a person or animal (e.g., "The monkey ran." "The monkey ate the banana.") and c) any instance of interaction between two animals and/or people (e.g., "The man caught Curious George and tied him up." "The monkey liked the man.") The maximum score is 12, i.e., each of the three indicators present in each of the four pictures in a series.
9. Number of Repetitions of Questions - A count per interview of the number of original questions that the examiner had to repeat in order to elicit any response from the child. This does not include probes for additional information. No question was repeated more than once in its original form.
10. Number of Probes for Correct Telephone Behavior - a count of the number of probes that were given by the examiner in order to elicit appropriate phone behavior from the child; e.g., "Talk louder." "I can't hear you." "You'll have to tell me with words because I can't see you." "Talk right into the telephone."

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Preliminary Report on the
Use of Several Early
Childhood Inventories for
The Evaluation of Educational
Programs

Report #3A

Jack Victor and Alan R. Collier

March, 1968

NOT TO BE CIRCULATED OR QUOTED WITHOUT PERMISSION

Acknowledgements

We wish to thank Drs. Rhoda Cutler, Cynthia Deutsch, Martin Deutsch, Leo Goldstein, Lassar Gotkin, Estelle Peisach and Martin Whiteman for the cooperation and many helpful suggestions they gave throughout the course of this study. We especially would like to thank John Dill for his help in coordinating the study, and Norman Wein for his help in setting up computer programs and testing schedules.

A special note of thanks must go to the energetic and dedicated efforts of the Early Childhood Inventories Project staff who helped to both develop and administer the inventories: Karen Berman, John Dill, Judy Johnson, Louise Kasdan, Karla Lefren, Ellen Rafel. Others who helped in various phases of the project are: Gywen Bianco, Ann Bishop, David Crystal, Helene Friedman, Judy Gorrell, Sarah Tehan, Howard Tilis and Mark Vlosky.

This study would be impossible without the cooperation of the New York City Board of Education, and the teachers and administrators of Public Schools 68, 79, 123, and 175. The cooperation of the various supervisors was essential to the success of the project, and we would like to thank particularly Jacqueline Stuchin, Laura Schneider, Fay Fondiller, and Joan Ehren.

Finally we would like to thank the United States Office of Education for providing the funds for this part of the study.

Jack Victor
Alan Collier

Introduction

Many available standardized tests of ability, developed for the young child, are designed to provide a general picture of the child's performance across a wide but incomplete spectrum of behavior. The global measures yielded by such tests do not indicate how well the child fared on each of the included abilities. Often separate scores cannot be determined readily; frequently, even when sub-test scores can be calculated, as in multiple-aptitude batteries, one finds that the item pool is simply not practical, and cannot fulfill many of the current assessment needs. Of late, psychologists and educators have come to realize that such tests have limited use as diagnostic instruments. It is felt that emphasis should now be placed on constructing instruments which would provide a more complete picture of the child's ability within a narrow band of behavior. A battery of these specially constructed tests can give a profile of the child's strengths and weaknesses across a number of very specific ability areas, thereby providing information of obvious diagnostic value.

The Early Childhood Inventories Project (ECIP), currently under the joint directorship of Alan Collier and Jack Victor, was initiated at the Institute for Developmental Studies (IDS) for the purpose of developing original aptitude/achievement-type inventories which could be used to assess very specific behaviors of young children, particularly disadvantaged children. The inventories, which measure behaviors appropriate to early childhood educational goals, are designed to be used for a variety of purposes: 1) the evalua-

tion and comparison of educational programs, such as, the IDS "enrichment" program, Head Start programs, etc., 2) the evaluation and comparison of experimental curricula, 3) the establishment of curricula based upon an assessment of group abilities and disabilities, and 4) the determination of individual differences which could have immediate diagnostic and predictive value for the teacher.

The study to be described below has three primary purposes: 1) the comparison of several educational programs, 2) the collection of normative data, and 3) the preliminary standardization of six inventories developed by the ECIP staff. This report will only deal with the first primary purpose; i.e., the comparison of several educational programs, namely, the IDS "enrichment" program, a Head Start program, and regular New York City Board of Education programs. Other comparisons are cross-sectional in nature and cover pre-kindergarten, kindergarten and first-grade classes.

Inventories

The following six inventories developed by the ECIP staff at the Institute for Developmental Studies are being used in the study to be described:

1. Same/Different Inventory-3 (S/DI-3)
2. Body Parts Name Inventory (BPNI)
3. Color Name Inventory (CNI)
4. Shape Name Inventory (SNI)
5. Numeral Name Inventory-1 (NNI-1)
6. Alphabet Name Inventory/Printed Upper Case (ANI/PUC)

For purposes of analysis, these six inventories have been broken down into thirteen subtests (or measures). All of the inventories, with the exception of the Same/Different Inventory-3, have a "nonverbal"¹ and a "verbal"² subtest. In addition, the Body Parts Name Inventory has a "functions" subtest. The Same/Different Inventory-3 contains two nonverbal subtests, "same" and "different."

The six inventories listed above are more fully described elsewhere. It should be noted that all of the inventories except the S/DI-3 and the BPNI have alternate forms.

Subjects

The children in this study are low socioeconomic status pre-kindergarten, kindergarten, and first-grade inner-city Negro boys and girls attending public schools in the Harlem area of New York City. In this study, there are eight groups -- two pre-kindergarten groups, three kindergarten groups and three first-grade groups. The groups are described below. The first set of capital letters indicate whether the group is either in Enrichment group (E) or a Comparison group (C or CHS). The lower case letters or numbers which follow indicate the grade in which the group officially started school. The capital letters or numbers which follow the hyphen indicate the grade in which the groups are presently enrolled.

¹nonverbal subtests are tests of receptive language or recognition memory.

²verbal subtests are tests of expressive language or recall memory.

GROUP DESIGNATIONS

Epk-PK	--	An enrichment group now entering IDS pre-kindergarten.
Epk-K	--	An Enrichment group having enriched pre-kindergarten experience now entering IDS kindergarten.
Epk-1	--	An Enrichment group having had enriched pre-kindergarten and kindergarten experience now entering IDS first grade.
CHSpk-PK	--	A group now entering the N.Y.C. Board of Education Head Start Pre-kindergarten.
CHSpk-K	--	A group having had Head Start pre-kindergarten experience now entering the N.Y.C. Board of Education Head Start kindergarten.
Ck-K	--	A group having had no pre-kindergarten experience now entering the regular N.Y.C. Board of Education kindergarten.
Ck-1	--	A group having had no pre-kindergarten experiences, but having had regular kindergarten experience, now entering the regular N.Y.C. Board of Education first grade.
Cl-1	--	A group having had no kindergarten experience (although some have had pre-kindergarten experience) now entering the regular N.Y.C. Board of Education first-grade.

Comparison Groups

	Enrichment	Head Start	Kindergarten	First Grade
Pre-kindergarten	Epk-PK	CHSpk-PK	-	-
Kindergarten	Epk-K	CHSpk-K	Ck-K	-
First Grade	Epk-1	-	Ck-K	Cl-1

There are three IDS enrichment groups (one from each grade level Epk-PK, Epk-K and Epk-1), two Head Start¹ control groups

¹It should be noted that Head Start programs differ from one another. Therefore, it is not necessarily the case that the Head Start program evaluated in this study is representative of Head Start programs in general.

(pre-kindergarten CHSpk-PK, and kindergarten CHSpk-K); two groups of children who began school in kindergarten (one group now entering kindergarten, Ck-K), and one now in first grade, Ck-1); and finally, one group of children who are now entering first grade without having had any kindergarten experience, Cl-1. (Note: Almost one-half of this last group did have some form of pre-kindergarten experience).

Design of Study

There are two parts to this study: 1) a pre-test, which began in the last week of October, 1967, some three weeks after school commenced (New York City schools began late due to a teacher strike) and 2) a post-test -- to begin sometime in the Spring of 1968.

This report will address itself only to a preliminary analysis of pre-test data. Pretesting was completed after about five weeks of testing.

The six inventories listed above were administered to 220 children over two sessions. During the first session, the Body Parts Name Inventory (BPNI) and the Color Name Inventory (CNI) were administered in full, while only one of the two alternate forms of the "non-verbal" sub-tests of the Numeral Name Inventory-1 (NNI-1) and Alphabet Name Inventory/Printed Upper Case (ANI/PUC) were administered. During the second session, the Same/Different Inventory-3 (S/DI-3) and the Shape Name Inventory (SNI) were administered in full, while the remaining alternate forms of the non-verbal sub-tests of the Numeral Name Inventory-1 (NNI-1) and Alphabet Name Inventory/Printed Upper Case (ANI/PUC) were administered. Depending

upon the child, each session lasted between twenty and forty-five minutes.

Data Analysis

We must stress the fact that the following analyses are preliminary and basic. Future analyses might very well require us to revise the results and interpretations found herein. Pressures for the dissemination of these results, even in their unrefined form, led us to believe that these results should be reported as early as possible.

Most of the results presented below are based upon a Critical Ratio (CR) analysis of differences between independent means, a few analyses made use of the "t" test. No other statistical tests of significance were used for this report. Future reports will include a multivariate analysis thereby providing a more sensitive test of the results of this study.

It should be noted that most non-verbal (receptive language) scores are notated NV-2 in the tables. This refers to the fact that the scores represent the total "2" scores per inventory. A "2" score is a score representing a correct response on any particular item on both forms. Hence, each item must be recognized twice to be scored as correct. This procedure acts as a check on guessing and, therefore, gives us a rather stringent measure of the child's ability. The results of studies using similar tests as our non-verbal measures may, therefore, yield higher scores than our measures do. Obviously, the total correct on either alternate form taken by itself is at least as high and usually higher than the total score reported here as NV2.

RESULTS

A. Group Differences within Grade Levels1. Prekindergarten

None of the thirteen Critical Ratios (CRs) reached the .05 level of significance.** These findings support the hypothesis that the IDS enrichment prekindergarten group (Epk-PK) and the Comparison Head Start prekindergarten group (CHSpk-PK) do not differ prior to exposure to the school situation. Further support for the above hypothesis is obtained from analyzing the results of the Peabody Picture Vocabulary Test (PPVT) and the Stanford-Binet/Form L-M (S-B) which were administered to the above mentioned children at about the same time as the Early Childhood Inventories. Statistical tests of the differences between the two groups using the t-test statistic did not reach the .05 level of significance,** thereby adding support to the thesis that the groups do not differ from each other. The mean scores on the PPVT for the Epk-PK and CHSpk-PK, respectively, were 68.03 and 63.87. For the Stanford-Binet the mean scores were 91.97 for the Epk-PK group and 86.17 for the CHSpk-PK group.

2. Kindergarten

a. An examination of the results obtained from the IDS enrichment kindergarten group (Epk-K) and the Comparison Head Start kindergarten group (CHSpk-K) revealed that seven of the thirteen measures reached significance at least at the .05 level.* All of

*one tailed test

**two tailed test

the significant differences were in the direction of the IDS group. The one-tailed test was used because of an experimental hypothesis which predicted the direction of the differences at the kindergarten level $E > CHS > Ck$.

Three mean differences were in the direction contrary to the experimental hypothesis. Though not significant, these differences were in favor of the Comparison Head Start group. The differences occurred on the two sub-tests of the Same/Different Inventory-3 (S/DI-3) and on the Functions sub-test of the Body Parts Name Inventory (BPNI-F).

Inspection of the seven significant CRs revealed that the advantage of the Epk-K group lay heavily in increased skill in expressive language.¹ Significant CRs* were obtained on all five verbal sub-tests. The non-verbal sub-tests of the Color Name Inventory (CNI-NV) and the Alphabet Name Inventory/Printed Upper Case (ANI/PUC-NV) also yielded significant CRs in favor of the Epk-K group.

These differences are all the more telling when considering results obtained from administering the PPVT and S-B to these subjects prior to educational intervention. As in the case of the current pre-kindergarten children, we found no significant difference** on either the PPVT or the S-B between the IDS enrichment children and the Comparison Head Start children. The mean scores on the PPVT for the Epk-k and CHSpk-K, prior to educational intervention, were 71.63 and 68.39 respectively. For the S-B the mean

¹Expressive language here relates to the ability to recall the appropriate label of a stimulus.

scores were 95.70 for the Epk-K group and 94.32 for the CHSpk-k group.

b. Comparison of all 13 measures between the IDS enrichment kindergarteners (Epk-K) and comparison children beginning the regular New York City Board of Education kindergarten (Ck-K) yielded differences in the hypothesized direction. All mean differences were in the direction of the IDS group. Only two mean differences did not reach significance at the .05 level.* The measures not reaching significance were the Same sub-test of the Same/Different Inventory-3 (S/DI-3-S) and the Functions sub-test of the Body Parts Name Inventory (BPNI-F).

c. Comparison Head Start kindergarten children (CHS-pk-K) obtained higher mean scores on 12 of the 13 measures than did the comparison children who were beginning the regular New York City Board of Education kindergarten (Ck-K). However, only four of these mean differences reached significance at the .05 level.* The CHSpk-K group did significantly better on both sub-tests of the Same/Different Inventory-3 (S/DI-3) and on the Verbal and Functions sub-tests of the Body Parts Name Inventory (BPNI-V and BPNI-F).

3. First Grade

a. Children in the IDS enrichment first-grade group (Epk-1) obtained higher mean scores on all 13 measures than: 1) comparison children whose first experience in school was in a regular New York City Board of Education kindergarten and at the time of testing were entering a regular first-grade class (Ck-1), and 2) comparison children who did not have regular kindergarten and at the time of testing

were entering a regular New York City Board of Education first-grade class (C1-1).

Seven of the differences between the IDS enrichment first graders (Epk-1) and the Ck-1 are significant, at least at the .05 level.* The one-tailed test was also used for the first grade comparisons because an experimental hypothesis predicted the direction of the differences, $E > Ck > C1$. The seven measures which yielded significant differences in favor of the IDS group were: both sub-tests of the Numeral Name Inventory-1 (NNI-1); the three sub-tests of the Body Parts Name Inventory (BPNI); the verbal sub-test of the Alphabet Name Inventory/Printed Upper Case (ANI/PUC-V); and the non-verbal sub-test of the Color Name Inventory (CNI-NV).

With only the exception of the Different sub-test of the Same/Different Inventory-3 (S/DI-3-D), all of the mean differences between the Epk-1 group and the C1-1 group are significant at the .05 level.*

b. The first-grade children who had attended regular kindergarten, (Ck-1) had higher mean scores on all measures than the group of first-grade children who had not attended kindergarten (C1-1). Six of these differences reached significance at least at the .05 level.* The six measures which yielded significant differences were the non-verbal and verbal sub-tests of the Color Name Inventory (CNI), the Shape Name Inventory (SNI) and the Body Parts Name Inventory (BPNI-NV and BPNI-V).

B. Cross-Sectional Differences Within Groups

Generally, the inventories were able to distinguish signifi-

cantly between children in different grade levels within the same comparison group. Hence, the first-grade IDS enrichment group (Epk-1) obtained higher mean scores on all measures than did the IDS enrichment kindergarten group (Epk-K) who, in turn, obtained higher mean scores on all measures than the IDS enrichment pre-kindergarten group (Epk-PK).

Likewise, the Comparison Head Start kindergarten group (CHSpk-K) obtained higher mean scores on all measures than the Comparison Head Start pre-kindergarten group (CHSpk-PK). The first-grade group who began school in kindergarten (Ck-1) obtained higher mean scores on all measures than the group that was first entering regular kindergarten (Ck-K).

All but five of the 52 possible within-group comparisons reached significance at least at the .05 level.* A one-tailed test was used in these cases because of an experimental hypothesis which predicted a within-group grade effect, $1 > K > PK$. The difference between the Ck-K and Ck-1 groups on the non-verbal sub-test of the Body Parts Name Inventory (BPNI-NV) did not reach significance. The remaining four non-significant differences involved comparisons between the IDS enrichment kindergarteners (Epk-K) and the IDS enrichment first graders (Epk-1). The measures which did not reach significance were the non-verbal and verbal sub-tests of the Alphabet Name Inventory/Printed Upper Case (ANI/PUC), and the verbal sub-tests of the Color Name Inventory (CNI-V) and the Shape Name Inventory (SNI-V).

C. Cross-Sectional Differences Across Groups

1. Kindergarten and pre-kindergarten comparisons

Such analyses were not made, since intervention had not yet occurred for the pre-kindergarten groups.

2. First grade and kindergarten comparisons.

a. The mean scores of the IDS enrichment kindergarten group (Epk-K) were found not to be significantly different** from the mean scores of the comparison group of children a grade higher who had had regular New York City Board of Education kindergarten experience (Ck-1). Only on the Same sub-test of the Same/Different Inventory-3 (S/DI-3-S) was a significant difference obtained in favor of the first-grade group.

b. In contrast, the Comparison Head Start kindergarten group (CHSpk-K) obtained significantly lower mean scores** than the aforementioned first grade group (Ck-1) on both sub-tests of the Shape Name Inventory (SNI) and Numeral Name Inventory-1 (NNI-1), as well as on the non-verbal sub-test of the Alphabet Name Inventory/Printed Upper Case (ANI/PUC-NV). The mean scores of the Comparison Head Start group (CHSpk-K) and the first-grade, Ck-1 group did not differ significantly on the remaining eight measures.

c. Significant differences** were obtained on six measures when the IDS enrichment kindergarten group (Epk-K) was compared to the comparison group of first graders who did not have any kindergarten experience (Cl-1). All of these significant differences were in favor of the IDS children who were one grade lower. The IDS enrichment kindergarten group (Epk-K) obtained significantly higher mean scores on the verbal and non-verbal sub-tests of the Color Name Inventory (CNI), the Shape Name Inventory (SNI), and the Body Parts

Name Inventory (BPNI-V and BPNI-NV).

d. The Comparison Head Start kindergarten group (CHSpk-K) obtained significantly higher mean scores** than the aforementioned first-grade group (Cl-1), on the verbal and non-verbal sub-tests of the Body Parts Name Inventory (BPNI-V and BPNI-NV). However, the CHSpk-K group obtained significantly lower scores** on both sub-tests of the Numeral Name Inventory-1 (NNI-1). No other differences between these groups were found to be significant.

e. When the kindergarten group with no pre-kindergarten experience (Ck-K) is compared with a group of first-grade children who had had no kindergarten experience (Cl-1), the grade effect is apparent. The Cl-1 group obtained significantly higher mean scores** on six of the 13 measures -- both sub-tests of the Same/Different Inventory-3 (S/DI-3), the Numeral Name Inventory-1 (NNI-1), and the Alphabet Name Inventory/Printed Upper Case (ANI/PUC).

DISCUSSION

A preliminary analysis of the results of this study appear to indicate that the Institute for Developmental Studies (IDS) enrichment program and the New York City Board of Education Head Start program compared in this study produce significant positive effects in the educational development of young, inner-city, low socioeconomic status Negro children from the Harlem area of New York City.

Children entering kindergarten after having attended either the IDS pre-kindergarten enrichment program or the New York City Head Start pre-kindergarten program obtained higher mean scores on the six Early Childhood Inventories used in this study than did children entering kindergarten without having had the benefit of pre-kindergarten experience.

It is possible to argue that the IDS pre-kindergarten program or the Head Start pre-kindergarten program did not actually produce educational change. It might be said that the children who did not have the benefit of pre-kindergarten experience (CKs) were different initially from the children who entered the IDS or Head Start pre-kindergarten programs. After all, the parents who placed their children in pre-kindergarten had to be "interested enough" in their children to volunteer them for enrichment. If these groups differed initially in some major way, then any conclusions concerning the beneficial effects of pre-kindergarten experience must be considered tenuous in nature.

There is, however, indirect evidence which tends to support

the assumption of initial equivalence of these groups. The initial design of the IDS enrichment evaluation study included a comparison group of children (comparison self-selected-CSS) whose parents volunteered them for the IDS pre-kindergarten program, but who were randomly excluded from having enrichment. When tested with the Peabody Picture Vocabulary Test (PPVT) and the Stanford-Binet (S-B), this group, generally, was no different from the group of children who were randomly selected to attend the IDS enriched pre-kindergarten. When the comparison self-selected group entering kindergarten (CSS-K) was compared with the non-self-selected group entering kindergarten (Ck-K) on the Peabody Picture Vocabulary Test and on the Stanford-Binet no significant differences were obtained.¹ One can assume, therefore, that if the enriched group (E) and the comparison self-selected group (CSS) did not differ initially and if the comparison self-selected (CSS) group and the non-self-selected (Ck) group did not differ at kindergarten, then all things being equal, the enriched (E) group and the non-self-selected (Ck) group did not differ initially. Given this assumption, the data seems to support the contention that pre-kindergarten experience produces educational change.

¹ The comparisons mentioned here involve the combined scores of three successive CSS and Ck-K groups which were used as comparison groups for the 1963-4, 1964-5 and 1965-6, IDS enrichment pre-kindergarten groups, respectively. The mean S-B scores were 92.15 for the CSS groups and 90.48 for the Ck-K groups. The mean PPVT scores were 72.65 for the CSS groups and 72.13 for the Ck-K groups. It should be noted that the CSS children were tested slightly earlier than the Ck-K group. The CSS children were tested at the end of what would have been their pre-kindergarten year, while the Ck-K groups were tested at the beginning of kindergarten.

We do not mean to imply from the above that mere attendance in a pre-kindergarten program is sufficient to produce positive educational change. The type of pre-kindergarten program is a crucial factor. While both the IDS and Head Start pre-kindergarten programs appeared to affect educational performance, the educational value of these programs was not equivalent. For example, while the Head Start kindergarten children (CHSpk-K) obtained higher scores than the CK group on virtually every measure, only four of the thirteen possible differences reached a satisfactory level of statistical significance. In contrast, IDS kindergarteners (Epk-k) obtained significantly higher scores than the CK group on eleven of the thirteen measures.

When the IDS kindergarteners (Epk-k) are compared directly with the Head Start kindergarteners (CHSpk-k) we find that the IDS group obtains significantly higher scores on seven of the thirteen measures. In no case does the Head Start kindergarten group score significantly higher than the IDS kindergarten group. Given that the two groups were equivalent prior to any intervention, the results would indicate that more positive effects result from the IDS pre-kindergarten program than from the New York City Head Start pre-kindergarten program.

There are also good reasons to assume that these two groups were initially equal. When tested with the Peabody Picture Vocabulary Test and the Stanford-Binet prior to receiving educational intervention at pre-kindergarten, both groups obtained equivalent scores. Moreover, no differences were obtained between a group of children beginning IDS pre-kindergarten and a group of children

beginning the Head Start pre-kindergarten.

The positive effect of the IDS enrichment program extends also into first grade. When we compare the IDS Enrichment first-grade children to a group of first-grade regular kindergarten graduates and to a group of children entering regular first grade without having had the benefit of kindergarten experience, we find that the IDS Enrichment children obtain significantly higher scores on a majority of the thirteen measures.

Indeed, when we compare the IDS Enrichment kindergarten children to first-grade children having had regular kindergarten experience, we find that the older children obtain a significantly higher score on only one of the thirteen measures. Assuming initial equivalence, it is possible to conclude that the IDS Enrichment program has advanced the children about a year in their educational development, at least on the measures used in this study.

In comparison, the Head Start children obtain equivalent scores on eight of the thirteen scores. The older children obtain significantly higher scores on the remaining five measures.

A further illustration of the relative efficacy of IDS Enrichment and Head Start is found in the comparison of the three kindergarten groups to the group of first-grade children who did not have the benefit of kindergarten. The grade effect is shown in the comparison of this last group to children beginning regular kindergarten (all six significant differences are in the direction of the older children). However, Head Start kindergarten children obtain either equivalent or higher scores than the older children on all

but two measures. In contrast to both these kindergarten groups, the IDS Enrichment kindergarten children obtain higher scores than the older children on six of the thirteen measures. None of the remaining seven measures shows any difference between the two groups.

Some final comments on the possible implications of these results should be made. The findings of this study do not necessarily reflect differences in the effectiveness of the different educational programs compared. Any conclusions drawn from these results must take into account the fact that educational goals may vary from one program to another. Some programs may not even have a curriculum for some of the achievement areas measured by the battery of Early Childhood Inventories used in this study. Other behaviors may have been emphasized at the expense of those skills measured by this battery of inventories in the comparison groups.¹ On the other hand, IDS children might well have fared better than the comparison groups, no matter what relevant skill areas had been selected for investigation. Observations concerning the training of cognitive skills in the programs evaluated here certainly suggest the likelihood of this latter interpretation.

Although the results discussed here are preliminary, they are so striking that there is no doubt that the Early Childhood Inventories will play an important role in future evaluations of early childhood educational programs.

¹For example, certain reading programs suggest that teachers should avoid teaching the child to label the letters of the alphabet, the implication being that this practice would interfere with initial reading skills. The IDS approach, on the contrary, includes teaching alphabet names to mastery on the assumption that this will actually facilitate initial reading skills.

Early Childhood Inventory Project

Appendices

- A. Sub-Tests and Possible Range of Scores
- B. Score Sheet with Facsimile of Inventory Items
- C. Tables of Means, Standard Deviations, and Standard Errors of the Mean Squared for each Inventory
- D. Combined Table of Means and Standard Deviations (over the eight groups + 13 measures)
- E. Summary Table of Critical Ratio Levels of Significance for Differences Between Groups

Appendix A

List of Sub-Tests and Their Possible Score Range

<u>Sub-Test Number</u>	<u>Name of Inventory</u>	<u>Name of Sub-Test</u>	<u>Possible Range of Scores</u>
1	S/DI-3	Exactly the Same	0-12
2		Different	0-12
3	NNI	Non-Verbal	0-20
4		Verbal	0-20
5	CNI	Non-Verbal	0-12
6		Verbal	0-12
7	ANI/PUC	Non-Verbal	0-26
8		Verbal	0-26
9	SNI	Non-Verbal	0-8
10		Verbal	0-8
11	BPNI	Non-Verbal	0-10
12		Verbal	0-10
13		Functions	0-5

Note: Except for BPNI, Non-Verbal measures refer to the total correct on both forms (e.g., if the letter "G" is correct on Form A, but not on Form B, it is scored as incorrect.) Hence the non-verbal scores reflect the total "2" scores.

ECIP INDIVIDUAL SCORING SHEET

Child's Name _____

Date of Birth _____ Sex: M F

Date of Testing _____

Ad's Initials _____

School _____ Grade: PRE-K K
I 2

Community Name _____

County _____ State _____

Bilingual: YES NO Principal Language _____

LEAVE GRID BLANK FOR IEM CODING

a	a	b	b	c	c
SLS	c	d	d	e	f
MO	f	g	h	i	j
R					

SAME DIFFERENT INVENTORY-III
(SDI-III)

SAME		DIFFERENT	
1. L R	7. L R	1. L R	7. L R
2. L R	8. L R	2. L R	8. L R
3. L R	9. L R	3. L R	9. L R
4. L R	10. L R	4. L R	10. L R
5. L R	11. L R	5. L R	11. L R
6. L R	12. L R	6. L R	12. L R
TOTAL _____		TOTAL _____	

SAMPLES

i. L R iii. L R i. L R iii. L R

ii. L R iv. L R ii. L R iv. L R

COLOR NAME INVENTORY (CNI)

VERBAL (V)

1. pur	5. gry	9. tan
2. blu	6. org	10. blk
3. red	7. wht	11. yel
4. brn	8. grn	12. prk
TOTAL _____		

NUMERAL NAME INVENTORY (NNI)

NONVERBAL (NV)

Set A

i. a b c d

ii. a b c d

iii. a b c d

iv. a b c d

A	0	2	14	10
B	6	18	4	16
C	19	2	12	4
D	10	3	13	5
E	4	14	6	18
F	7	15	12	5
G	13	8	16	6
H	15	17	7	9
I	18	11	0	8
J	1	17	19	9

v. a b c d

vi. a b c d

K	10	9	0	12
L	5	13	1	11
M	8	2	14	12
N	13	3	6	15
O	14	3	16	4
P	17	15	5	2
Q	1	11	3	16
R	19	0	17	7
S	8	7	18	11
T	9	19	1	10

TOTAL _____

NONVERBAL (NV)

Set B

i. a b c d

ii. a b c d

iii. a b c d

iv. a b c d

A	14	10	0	2	1	2
B	4	16	6	18	1	2
C	12	4	19	2	1	2
D	13	5	10	3	1	2
E	6	18	4	14	1	2
F	12	5	7	15	1	2
G	16	6	13	8	1	2
H	7	9	15	17	1	2
I	0	8	18	11	1	2
J	19	9	1	17	1	2

v. a b c d

vi. a b c d

K	0	12	10	9	1	2
L	1	11	5	13	1	2
M	14	12	8	2	1	2
N	6	15	13	3	1	2
O	16	8	14	3	1	2
P	5	2	17	15	1	2
Q	3	16	1	11	1	2
R	17	7	19	0	1	2
S	18	11	8	7	1	2
T	1	10	9	19	1	2

TOTAL _____

VERBAL (V)

A 4	F 7	K 15	P 14
B 8	G 16	L 17	Q 6
C 10	H 11	M 9	R 1
D 12	I 0	N 2	S 19
E 5	J 3	O 18	T 13
TOTAL _____			

COLOR NAME INVENTORY (CNI)

NONVERBAL (NV)

Set A	Set B
1. pur blu red brn	1. brn red blu pur 1 2
2. gry org wht grn	2. gen wht org gry 1 2
3. tan blk yel prk	3. prk yel blk tan 1 2
4. red brn gry org	4. org gry brn red 1 2
5. wht gen tan blk	5. blk tan grn wht 1 2
6. yel prk pur blu	6. blu pur prk yel 1 2
7. blu red brn gry	7. gry brn red blu 1 2
8. org wht gen tan	8. tan gen wht org 1 2
9. blk yel prk pur	9. pur prk yel blk 1 2
10. brn gry org wht	10. wht org gry brn 1 2
11. grn tan blk yel	11. yel blk tan grn 1 2
12. prk pur blu red	12. red blu pur prk 1 2
TOTAL _____	TOTAL _____

190 SHAPE NAME INVENTORY (SNI)

NONVERBAL

ii.	a	b	c	d	ii.	a	b	c	d
iii.	a	b	c	d	iii.	a	b	c	d
iv.	a	b	c	d	iv.	a	b	c	d
v.	a	b	c	d	v.	a	b	c	d
1.	K	T	O	J	1.	O	J	K	T
2.	M	Y	A	P	2.	A	P	M	Y
3.	I	W	S	M	3.	S	M	I	W
4.	V	T	G	H	4.	G	H	V	T
5.	L	G	V	O	5.	V	O	L	G
6.	Q	G	P	R	6.	P	R	Q	G
7.	J	N	C	F	7.	C	F	J	N
8.	A	P	Y	U	8.	Y	A	U	P
9.	X	N	B	O	9.	B	O	X	N
10.	R	E	K	Q	10.	K	Q	R	E
11.	X	C	N	B	11.	N	B	X	C
12.	S	U	W	I	12.	W	I	S	U
13.	D	K	I	W	13.	I	W	D	K
viii.	a	b	c	d	viii.	a	b	c	d
ix.	a	b	c	d	ix.	a	b	c	d
14.	Y	U	C	R	14.	C	R	Y	U
15.	Z	P	I	K	15.	I	K	Z	P
16.	D	K	W	T	16.	W	T	D	K
17.	G	A	H	X	17.	H	X	G	A
18.	Q	L	N	B	18.	N	B	Q	L
19.	F	Z	D	A	19.	D	A	F	Z
20.	T	M	O	J	20.	O	J	T	M
21.	C	R	J	B	21.	J	B	C	R
22.	N	Y	E	U	22.	E	U	N	Y
23.	G	I	H	X	23.	H	X	G	I
24.	O	L	F	Z	24.	F	Z	O	L
25.	L	O	V	M	25.	V	M	L	O
26.	Q	B	A	S	26.	A	S	Q	B
TOTAL					TOTAL				

Wheel	<u>VERBAL</u> #1	(V)
1.	N	1. Q
2.	O	2. B
3.	R	3. J
4.	T	4. G
5.	D	5. M
6.	I	6. V
7.	L	7. K
8.	H	8. W
9.	P	9. Y
10.	E	10. Z
11.	C	11. X
12.	A	12. U
13.	S	13. F

FOR IBM CODING

1. + △ □ <u>♡</u>	1. □ <u>♡</u> + △	1 2
2. <u>△</u> ♡ ◇ =	2. ◇ = <u>△</u> ♡	1 2
3. ○ + ☆ □	3. ☆ □ ○ +	1 2
4. ◇ ○ = ☆	4. = ☆ ◇ <u>○</u>	1 2
5. □ ☆ ± ○	5. + ○ □ ☆	1 2
6. ☆ = △ ◇	6. △ ◇ ☆ =	1 2
7. ♡ <u>□</u> ○ +	7. ○ + ♡ <u>□</u>	1 2
8. = ◇ ♡ △	8. ♡ △ = ◇	1 2

TOTAL	TOTAL
--------------	--------------

VERBAL

1. ★ _____

2. □ _____

3. ○ _____

4. + _____

5. ♥ _____

6. = _____

7. △ _____

8. ♦ _____

TOTAL _____

BODY PARTS NAME INVENTORY (BPNT)

<u>NONVERBAL</u> (NV)		<u>VERBAL</u> (V)	
1. Chin	1. Chin		
2. Stomach	2. Stomach		
3. Neck	3. Neck		
4. Arm	4. Arm		
5. Knee	5. Knee		
6. Ankle	6. Ankle		
7. Thigh	7. Thigh		
8. Cheek	8. Cheek		
9. Wrist	9. Wrist		
10. Knuckle	10. Knuckle		
TOT.	TOT.		

FUNCTIONS (F)

1. Shoes on
2. Hat on
3. Smell through
4. Gloves on
5. Lick with

TOT.

[illegible]

Appendix C

Tables of Means, Standard Deviations, and Standard Error
of the Mean Squared For Each Inventory

Symbols

M	Mean
SD	Standard Deviations
S_m^2	Standard error of the Mean Squared
N	Size of Sample Per Group
E	Enrichment Groups (IDS)
CHS	HeadStart Comparison Group
CK	Comparison Group Without Pre-Kindergarten
C1	Comparison Group Without Kindergarten (some children had pre-kindergarten experience)

Group Designations

pk	Groups Starting school at Pre-kindergarten
k	Groups Starting School at Kindergarten
1	Groups Starting School at First Grade
-PK	Groups Now Enrolled in Pre-Kindergarten
-K	Groups Now Enrolled in Kindergarten
-1	Group Now Enrolled in First Grade

Appendix C

Table 1

SAME/DIFFERENT INVENTORY - 3 (S/DI-3)

<u>SAME</u>				
<u>Pre-kindergarten</u>	<u>Epk-PK</u>	<u>CHSpk-PK</u>		
M	8.38	8.33		
SD	2.04	1.92		
S_m^2	0.15	0.13		
N	29	30		
<u>Kindergarten</u>	<u>Epk-K</u>	<u>CHSpk-K</u>	<u>Ck-K</u>	
M	10.03	10.70	9.22	
SD	1.83	1.70	2.37	
S_m^2	0.12	0.10	0.33	
N	30	30	18	
<u>1st Grade</u>	<u>Epk-1</u>		<u>Ck-1</u>	<u>C1-1</u>
M	11.41		11.03	10.57
SD	0.91		1.54	1.63
S_m^2	0.03		0.08	0.13
N	32		30	21
<u>DIFFERENT</u>				
<u>Pre-kindergarten</u>	<u>Epk-PK</u>	<u>CHSpk-PK</u>		
M	7.03	6.83		
SD	2.23	2.31		
S_m^2	0.18	0.18		
N	29	30		
<u>Kindergarten</u>	<u>Epk-K</u>	<u>CHSpk-K</u>	<u>Ck-K</u>	
M	10.10	10.40	8.00	
SD	1.65	1.90	3.11	
S_m^2	0.09	0.13	0.57	
N	30	30	18	
<u>1st Grade</u>	<u>Epk-1</u>		<u>Ck-1</u>	<u>C1-1</u>
M	11.19		10.67	10.38
SD	1.31		1.97	1.99
S_m^2	0.06		0.13	0.20
N	32		30	21

Appendix C
Table 2

NUMERAL NAME INVENTORY (NNI)

Non-verbal (corrected scores)

<u>Pre-kindergarten</u>	<u>Epk-PK</u>	<u>CHSpk-PK</u>		
M	2.38	2.80		
SD	3.45	3.87		
S_m^2	0.42	0.52		
N	29	30		
<u>Kindergarten</u>	<u>Epk-K</u>	<u>CHSpk-K</u>	<u>Ck-K</u>	
M	11.43	6.80	5.83	
SD	5.94	7.37	5.58	
S_m^2	1.22	1.87	1.83	
N	30	30	18	
<u>1st Grade</u>	<u>Epk-1</u>		<u>C_k-1</u>	<u>C_l-1</u>
M	15.97		11.77	10.81
SD	5.13		6.45	6.30
S_m^2	0.85		1.44	1.98
N	32		30	21

Verbal

<u>Pre-kindergarten</u>	<u>Epk-PK</u>	<u>CHSpk-PK</u>		
M	1.45	2.63		
SD	2.52	4.17		
S_m^2	0.23	0.60		
N	29	30		
<u>Kindergarten</u>	<u>Epk-K</u>	<u>CHSpk-K</u>	<u>C_k-K</u>	
M	10.43	6.13	5.33	
SD	5.42	6.80	6.40	
S_m^2	1.01	1.50	2.41	
N	30	30	18	
<u>1st Grade</u>	<u>Epk-1</u>		<u>C_k-1</u>	<u>C_l-1</u>
M	14.88		10.67	9.90
SD	5.45		6.50	6.06
S_m^2	0.96		1.46	1.83
N	32		30	21

Appendix C

Table 3

COLOR NAME INVENTORY (CNI)Non-Verbal (corrected scores)

<u>Pre-kindergarten</u>	<u>Epk-PK</u>	<u>CHSpk-PK</u>		
M	4.90	3.93		
SD	3.71	3.52		
S^2_m	0.49	0.43		
N	29	30		
<u>Kindergarten</u>	<u>Epk-K</u>	<u>CHSpk-K</u>	<u>C_k-K</u>	
M	10.37	9.67	8.89	
SD	1.56	2.94	2.59	
S^2_m	0.08	0.30	0.39	
N	30	30	18	
<u>1st Grade</u>	<u>Epk-1</u>		<u>C_k-1</u>	<u>C₁-1</u>
M	11.03		10.30	9.10
SD	1.09		1.68	2.41
S^2_m	0.04		0.10	0.29
N	32		30	21

Verbal

<u>Pre-kindergarten</u>	<u>Epk-PK</u>	<u>CHSpk-PK</u>		
M	4.28	3.70		
SD	3.34	3.74		
S^2_m	0.40	0.48		
N	29	30		
<u>Kindergarten</u>	<u>Epk-K</u>	<u>CHSpk-K</u>	<u>C_k-K</u>	
M	9.63	8.43	7.78	
SD	1.83	3.11	3.17	
S^2_m	0.12	0.33	0.59	
N	30	30	18	
<u>1st Grade</u>	<u>Epk-1</u>		<u>C_k-1</u>	<u>C₁-1</u>
M	10.06		9.57	7.14
SD	1.81		1.81	3.18
S^2_m	0.11		0.11	0.51
N	32		30	21

Appendix C
Table 4

ALPHABET NAME INVENTORY/
PRINTED UPPER CASE (ANI/PUC)

Non-Verbal (corrected scores)

<u>Pre-kindergarten</u>	<u>Epk-PK</u>	<u>CHSpk-PK</u>		
M	2.83	4.33		
SD	4.37	6.19		
S_m^2	0.68	1.32		
N	29	30		
<u>Kindergarten</u>	<u>Epk-K</u>	<u>CHSpk-K</u>	<u>C_k-K</u>	
M	13.70	9.73	6.61	
SD	8.50	8.81	6.63	
S_m^2	2.49	2.68	2.59	
N	30	30	18	
<u>1st Grade</u>	<u>Epk-1</u>		<u>C_k-1</u>	<u>C₁-1</u>
M	16.88		14.30	12.38
SD	8.83		7.59	8.46
S_m^2	2.52		1.99	3.58
N	32		30	21

Verbal

<u>Pre-kindergarten</u>	<u>Epk-PK</u>	<u>CHSpk-PK</u>		
M	1.52	3.10		
SD	2.52	5.87		
S_m^2	0.23	1.19		
N	29	30		
<u>Kindergarten</u>	<u>Epk-K</u>	<u>CHSpk-K</u>	<u>C_k-K</u>	
M	12.00	7.30	4.11	
SD	8.59	8.18	5.83	
S_m^2	2.54	2.31	5.83	
N	30	30	18	
<u>1st Grade</u>	<u>Epk-1</u>		<u>C_k-1</u>	<u>C₁-1</u>
M	14.41		10.80	10.19
SD	9.00		7.74	8.62
S_m^2	2.61		2.07	3.72
N	32		30	21

Appendix C

Table 5

SHAPE NAME INVENTORY (SNI)Non-Verbal (corrected scores)

<u>Pre-kindergarten</u>	<u>Epk-PK</u>	<u>CHSpk-PK</u>		
M	3.07	2.07		
SD	2.14	1.78		
S_m^2	0.16	0.11		
N	29	30		
<u>Kindergarten</u>	<u>Epk-K</u>	<u>CHSpk-K</u>	<u>C_k-K</u>	
M	6.13	5.77	4.94	
SD	1.83	1.68	1.80	
S_m^2	0.12	0.10	0.19	
N	30	30	18	
<u>1st Grade</u>	<u>Epk-1</u>		<u>C_k-1</u>	<u>C₁-1</u>
M	6.97		6.67	5.00
SD	0.97		1.32	1.45
S_m^2	0.03		0.06	0.10
N	32		30	21

Verbal

<u>Pre-kindergarten</u>	<u>Epk-PK</u>	<u>CHSpk-PK</u>		
M	2.10	1.20		
SD	2.14	1.40		
S_m^2	0.16	0.07		
N	29	30		
<u>Kindergarten</u>	<u>Epk-K</u>	<u>CHSpk-K</u>	<u>C_k-K</u>	
M	5.83	4.47	4.50	
SD	1.51	1.93	2.09	
S_m^2	0.08	0.13	0.26	
N	30	30	18	
<u>1st Grade</u>	<u>Epk-1</u>		<u>C_k-1</u>	<u>C₁-1</u>
M	6.44		5.90	4.24
SD	1.44		1.40	1.81
S_m^2	0.07		0.07	0.16
N	32		30	21

Appendix C

Table 6

BODY PARTS NAME INVENTORY (BPNI)

<u>Non-Verbal</u>				
<u>Pre-kindergarten</u>	<u>Epk-PK</u>	<u>CHSpk-PK</u>		
M	5.28	4.60		
SD	1.56	1.52		
S_m^2	0.09	0.08		
N	29	30		
<u>Kindergarten</u>	<u>Epk-K</u>	<u>CHSpk-K</u>	<u>C_k-K</u>	
M	6.83	6.33	5.89	
SD	1.44	1.63	1.49	
S_m^2	0.07	0.09	0.13	
N	30	30	18	
<u>1st Grade</u>	<u>Epk-1</u>		<u>C_k-1</u>	<u>C₁-1</u>
M	7.69		6.40	5.29
SD	1.45		1.45	1.52
S_m^2	0.07		0.07	0.12
N	32		30	21
<u>Verbal</u>				
<u>Pre-kindergarten</u>	<u>Epk-PK</u>	<u>CHSpk-PK</u>		
M	4.90	4.30		
SD	1.47	1.49		
S_m^2	0.08	0.08		
N	29	30		
<u>Kindergarten</u>	<u>Epk-K</u>	<u>CHSpk-K</u>	<u>C_k-K</u>	
M	7.00	6.27	5.39	
SD	1.49	1.66	1.61	
S_m^2	0.08	0.09	0.15	
N	30	30	18	
<u>1st Grade</u>	<u>Epk-1</u>		<u>C_k-1</u>	<u>C₁-1</u>
M	7.91		6.60	5.38
SD	1.35		1.52	1.32
S_m^2	0.06		0.08	0.09
N	32		30	21

Table 6 (continued)

<u>Functions</u>				
<u>Pre-kindergarten</u>	<u>Epk-PK</u>	<u>CHSpk-PK</u>		
M	3.24	2.50		
SD	1.60	1.43		
S_m^2	0.09	0.07		
N	29	30		
<u>Kindergarten</u>	<u>Epk-K</u>	<u>CHSpk-K</u>	<u>C_k-K</u>	
M	4.10	4.37	3.67	
SD	0.92	0.93	1.08	
S_m^2	0.03	0.03	0.07	
N	30	30	18	
<u>1st Grade</u>	<u>Epk-1</u>		<u>C_k-1</u>	<u>C₁-1</u>
M	4.78		4.37	4.24
SD	0.55		0.81	1.00
S_m^2	0.01		0.02	0.05
N	32		30	21

Appendix D

Combined Table of Means and Standard Deviations

Group	N	S/DI		S/DI		NNI		CNI		ANI/PUC		SNI		BPNI		BPNI	
		S	D	S	D	NV-2	V	NV-2	V	NV-2	V	NV-2	V	NV	V	V	F
		12*	12	12	12	20	20	12	12	26	26	8	8	10	10	10	5
EpK-PK	29	$\bar{X}$ 8.38	7.03	$\bar{X}$ 8.38	7.03	2.38	1.45	4.90	4.28	2.83	1.52	3.07	2.10	5.28	4.90	3.24	
		SD 2.04	2.23	SD 2.04	2.23	3.45	2.52	3.71	3.34	4.37	2.52	2.14	2.14	1.56	1.47	1.60	
EpK-K	30	$\bar{X}$ 10.03	10.10	$\bar{X}$ 10.03	10.10	11.43	10.43	10.37	9.63	13.70	12.00	6.13	5.83	6.83	7.00	4.10	
		SD 1.83	1.65	SD 1.83	1.65	5.94	5.42	1.56	1.83	8.50	8.59	1.83	1.51	1.44	1.49	0.92	
EpK-1	32	$\bar{X}$ 11.41	11.19	$\bar{X}$ 11.41	11.19	15.97	14.88	11.03	10.06	16.88	14.41	6.97	6.44	7.69	7.91	4.78	
		SD 0.91	1.31	SD 0.91	1.31	5.13	5.45	1.09	1.81	8.83	9.00	0.97	1.44	1.45	1.35	0.55	
CHSpk-PK	30	$\bar{X}$ 8.33	6.83	$\bar{X}$ 8.33	6.83	2.80	2.63	3.93	3.70	4.33	3.10	2.07	1.20	4.60	4.30	2.50	
		SD 1.92	2.31	SD 1.92	2.31	3.87	4.17	3.52	3.74	6.19	5.87	1.78	1.40	1.52	1.49	1.43	
CHSpk-K	30	$\bar{X}$ 10.70	10.40	$\bar{X}$ 10.70	10.40	6.80	6.13	9.67	8.43	9.73	7.30	5.77	4.47	6.33	6.27	4.37	
		SD 1.70	1.90	SD 1.70	1.90	7.37	6.80	2.94	3.11	8.81	8.18	1.68	1.93	1.63	1.66	0.93	
Ck-K	18	$\bar{X}$ 9.22	8.00	$\bar{X}$ 9.22	8.00	5.83	5.33	8.89	7.78	6.61	4.11	4.94	4.50	5.89	5.39	3.67	
		SD 2.37	3.11	SD 2.37	3.11	5.58	6.40	2.59	3.17	6.63	5.83	1.80	2.09	1.49	1.61	1.08	
Ck-1	30	$\bar{X}$ 11.03	10.67	$\bar{X}$ 11.03	10.67	11.77	10.67	10.30	9.57	14.30	10.80	6.67	5.90	6.40	6.60	1.37	
		SD 1.54	1.97	SD 1.54	1.97	6.45	6.50	1.68	1.81	7.59	7.74	1.32	1.40	1.45	1.52	0.81	
Cl-1	21	$\bar{X}$ 10.57	10.38	$\bar{X}$ 10.57	10.38	10.81	9.90	9.10	7.14	12.38	10.19	5.00	4.24	5.29	5.38	4.24	
		SD 1.63	1.99	SD 1.63	1.99	6.30	6.06	2.41	3.18	8.46	8.62	1.45	1.81	1.52	1.32	1.00	

*These numbers in this row represent maximum score for each sub-test.

**NV-2 = non-verbal "2" scores (or corrected scores) - see analyses of data section in body of report for fuller description of this score.

Appendix F

Summary Table of Critical Ratio
Levels of Significance for
Differences Between Groups

Comparisons

Group I	Group II	S/DI S	S/DI D	NNI NV-2	NNI V	CNI NV-2	CNI V	ANI NV-2	ANI V	SNI NV-2	SNI V	BPNI NV	BPNI V	BPNI F
A. Within Grade														
++EpK-PK	CHSpK-PK	--	--	--	--	--	--	--	--	--	--	--	--	--
+EpK-K	CHSpK-K	--	--	.005	.005	--	.05	.05	.025	--	.005	--	.05	--
+EpK-K	Ck-K	--	.005	.005	.005	.025	.025	.005	.0005	.025	.025	.025	.0005	--
+CHSpK-K	Ck-K	.025	.005	--	--	--	--	--	--	--	--	--	.05	.025
+EpK-l	Ck-l	--	--	.005	.005	.025	--	--	.05	--	--	.0005	.0005	.01
+EpK-l	Cl-l	.025	--	.005	.005	.0005	.0005	.05	.05	.0005	.0005	.0005	.0005	.025
+Ck-l	Cl-l	--	--	--	--	.05	.005	--	--	.0005	.0005	.01	.005	--
B. Cross Sectional Within Groups														
+EpK-K	EpK-PK	.005	.0005	.0005	.0005	.0005	.0005	.0005	.0005	.0005	.0005	.0005	.0005	.01
+EpK-l	EpK-K	.0005	.005	.005	.005	.05	--	--	--	.025	--	.025	.01	.0005
+CHSpK-K	CHSpK-PK	.0005	.0005	.005	.01	.0005	.0005	.005	.025	.0005	.0005	.0005	.0005	.0005
+Ck-l	Ck-K	.005	.005	.005	.005	.025	.025	.0005	.0005	.0005	.01	--	.01	.01
C. Cross Sectional Across Groups														
++Ck-l	EpK-K	.05	--	--	--	--	--	--	--	--	--	--	--	--
++Ck-l	CHSpK-K	--	--	.01	.01	--	--	.05	.01	.05	--	--	--	--
++Cl-l	EpK-K	--	--	--	--	*.05	*.01	--	--	*.02	*.01	*.005	*.005	--
++Cl-l	CHSpK-K	--	--	.05	.05	--	--	--	--	--	--	*.05	*.05	--
++Cl-l	Ck-K	.05	.01	.02	.05	--	--	.02	.02	--	--	--	--	--

++ two-tailed test

+ one-tailed test

* difference in favor of Group II

Note: Numbers represent level of significance reached.
Actual CR's will be presented in subsequent reports.

Institute for Developmental Studies
School of Education
New York University

An Evaluation of the Effectiveness of an Enriched
Curriculum in Overcoming the Consequences of
Environmental Deprivation (OE-5-10-045)

Compiled and Written by:
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Co-director:
Leo S. Goldstein, Ph.D.

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Progress Report on
Contract OE-5-10-045
Bureau # 50342

Period Covered by Report: January 1, 1968 - June 30, 1968

Title of Project: An Evaluation of the Effectiveness of An Enriched Curriculum in Overcoming the Consequences of Environmental Deprivation.

Name of Project Director and Co-director: Martin Deutsch, Ph.D. &
Leo S. Goldstein, Ph.D.

I. Major Activities of Reporting Period

A. Data Collection

During this period, follow-up psychological evaluations were made of experimental, filler, and control subjects, from pre-kindergarten through fourth grade, with a variety of instruments.

1. Wave 1 (1962-63) As part of the basic design, experimental, control and filler subjects of the first wave were followed up with the S-B, PPVT, and CMMS. In all, 67 fourth graders were tested; 26E, 9C_{SS}, 12C_k, 12C₁ and 8 Fillers.

2. Wave 2 (1963-64) The S-B, PPVT, & CMMS were administered to 128 3rd graders: 20E, 15C_{SS}, 20C_k, 26C₁, and 47 Fillers. At this grade level, the Gates-MacGinitie test was given to 115 children: 19E, 14C_{SS}, 19C_k, 16C₁ and 47 Fillers. One hundred thirty-one subjects of this wave received the WISC. Of these, there were 21E, 16C_{SS}, 22C_k, 24C₁ and 48 Fillers.

3. Wave 3 (1964-65) These subjects were tested at the second grade level. The Lorge-Thorndike was administered to 154 children: 36E, 17C_{SS}, 35C_k, 32C₁ and 34 Fillers. The Gates-MacGinitie was given to 140 subjects: 36E, 17C_{SS}, 31C_k, 23C₁ and 33 Fillers.

4. Wave 4 (1965-66) One hundred two of these first graders received the Gates-MacGinitie test. Of these, there were 38E, 11C_{SS}, 29C_k, 20C₁ and 4 Fillers. The Lorge-Thorndike was given to 117 subjects: 43E, 14C_{SS}, 36C_k, 21C₁ and 3 Fillers.

5. Wave 5 (1966-67) The basic battery of S-B, PPVT and CMMS was administered to 127 of these Kindergarten children. Of these, there were 52E, 32C_k and 43C_c. Eighty-three of

these children, (28E, 17C_k and 38C_c), were given the Reading Prognosis test. (The control sample C_c are children from similar background as E, C_{ss}, C_k, and C_l subjects, but who attend Head Start classes in different public schools. Data from this group are not available.)

6. Wave 6 (1967-68) The first posttest at the end of pre-kindergarten was administered to 99 subjects: 63E and 36 C_c received S-B, PPVT and CMMS. A total of 1263 test sessions were conducted during this period for 697 subjects.

B. Data Analysis

The data collected at the end of this reporting period are now being prepared for machine analysis.

Some data collected previously have been analyzed. The results are shown in Tables 1-11.

Stanford-Binet data for the first four waves were analyzed to isolate wave, treatment and test period effects and their interactions. The analysis summarized in Table 1 indicates significant main effects for treatment and for test period. In addition, all interactions except wave x treatment are significant. The simple effects of the wave x test period and treatment x test period interactions were analyzed as shown in Tables 2 and 3. It appears, from an examination of the means (Table 4), and of Table 2, that the Wave 1 mean is higher at pretest, than those of the other waves. The differences between means of the waves vanish at the time of first and second posttests.

Table 3 indicates significant treatment differences at both posttest periods but not at pretest time (which is desirable). These differences (short term) are in favor of the E subjects (Table 4).

Similar analyses were done for the PPVT IQ scores. Table 5 shows significant main effects for treatment and test period as well as a significant treatment x test period interaction. The simple effects analysis of the latter (Table 6) and examination of Table 7 indicate significant mean differences in favor of the E children for both posttest periods. No significant differences obtained at pretest time.

Table 8 displays the analysis of the CMMS IQ data. Again, the main effects of treatment and test period are significant. Here, however, the wave x test period interaction and the triple interaction are also significant. Tables 9 and 10 analyze the wave x test period interaction. There are no significant effects for wave at either of the test periods (Table 10) but for waves 1 and 4, we do find significant test period effects (Table 9). Table 11 shows these differences are probably due to the poorer performance of the C_{ss} subjects.

II. Future Plans

A. Testing

During the period following the one reported here, pretest evaluations with the basic battery of S-B, PPVT and CMMS will be made of the E and C_c subjects selected for the 7th wave. Present plans call for the establishment of two pre-kindergarten classes in P.S. 68. Based on past experience, we expect an enrollment of 17 children in each class. We also anticipate that no children will be available to serve as C_{ss} subjects and that we will have to rely on Head Start classes for a comparison sample.

B. Analysis of Data

The data collected during this period will be analyzed and the results presented in the report for the period 7/1/68 - 12/31/68.

Table 1

S-B IQ: Wave (1-4) x Treatment (E/C_{SS}) x Test Period (P/P₁/P₂).
 Analysis of variance with repeated measures, unweighted means
 solution.

Source	SS	df	MS	F
<u>Between S's</u>		204		
A (Wave)	1354.84	3	451.61	1.26
B (Treatment)	2036.15	1	2036.15	5.70 ^a
AB	210.20	3	70.07	<1.00
Ss within grps.	70353.22	197	357.12	
<u>Within S's</u>		410		
C (Test Period)	1512.57	2	756.29	16.36 ^b
AC	786.41	6	131.07	2.84 ^c
BC	869.73	2	434.87	9.41
ABC	637.75	6	106.29	2.30 ^c
CxS's within grps.	18212.35	394	46.22	

$$^aF_{1, 200} (.95) = 3.89$$

$$F_{1, 200} (.99) = 6.76$$

$$^bF_{2, 400} (.99) = 4.66$$

$$^cF_{6, 400} (.95) = 2.12$$

$$F_{6, 400} (.99) = 2.85$$

Table 2

Simple effects analysis for AC interaction (Wave x Test period)
S-B IQ data of Table 1.

Simple
Effects:

<u>Wave</u>	SS	df	MS	F
for Test per. P	1587.77	3	529.26	3.53 ^a
for Test per. P ₁	324.84	3	108.28	< 1.00
for Test per. P ₂	335.49	3	111.83	< 1.00
Error (pooled)	88565.57	591	149.86	

$$^a F_{.95} (3, 400) = 2.62$$

$$F_{.99} (3, 400) = 3.83$$

Table 3 .

Simple effects analysis for BC interaction (Treatment x Test
period) S-B IQ data of Table 1.

Simple
Effects:

<u>Treatment</u>	SS	df	MS	F
for Test per. P	25.44	1	25.44	< 1.00
for Test per. P ₁	2184.02	1	2184.02	14.57 ^b
for Test per. P ₂	696.58	1	696.58	4.65 ^a
Error (pooled)	88565.57	591	149.86	

$$^a F_{.95} (1, 400) = 3.86$$

$$^b F_{.99} (1, 400) = 6.70$$

Table 4

Means and standard deviations of S-B IQ scores by wave, treatment and test period.

		Pretest		Posttest 1		Posttest 2		N
		$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s	
Wave 1								
	E	98.45	10.71	102.77	12.11	103.59	13.63	22
	C _{SS}	100.00	8.14	92.57	8.36	92.29	10.12	7
Wave 2								
	E	91.81	10.75	98.69	9.45	95.89	11.42	36
	C _{SS}	90.23	14.99	90.54	13.77	96.08	15.07	13
Wave 3								
	E	93.68	10.75	101.40	11.05	102.32	12.19	53
	C _{SS}	91.50	14.03	94.79	11.32	98.71	18.56	14
Wave 4								
	E	90.96	12.12	99.02	11.81	99.60	13.56	50
	C _{SS}	89.60	10.43	92.20	12.16	95.60	8.30	10
All Waves								
	E	93.08	11.45	100.44	11.27	100.22	12.96	161
	C _{SS}	92.05	13.30	92.59	12.02	96.21	14.60	44

Table 5

PPVT IQ: Wave (1-4) x Treatment (E/C_{SS}) x Test Period (P/P₁/P₂).
Analysis of variance with repeated measures, unweighted means
solution.

Source	SS	df	MS	F
<u>Between S's</u>		211		
A (Wave)	708.71	3	236.24	1.00
B (Treatment)	8097.72	1	8097.42	14.39 ^a
AB	2345.36	3	781.79	1.38
S's within grps.	114788.41	204	562.68	
<u>Within S's</u>		424		
C (Test Period)	15744.01	2	7872.01	60.83 ^b
AC	676.53	6	112.76	1.00
BC	2666.29	2	1333.15	10.30 ^b
ABC	376.40	6	62.73	1.00
CxS's within grps.	52805.15	408	129.42	

^aF_{.99} (1, 200) = 6.76

^bF_{.99} (2, ∞) = 4.61

Table 6

Simple effects analysis of BC interaction (Treatment x Test Period)
PPVT IQ data of Tables.

<u>Simple effects of Treatment:</u>	SS	df	MS	F
for Test Period P	146.15	1	146.15	1.00
for Test Period P ₁	7017.05	1	7017.05	25.62 ^a
for Test Period P ₂	3600.63	1	3600.63	13.65 ^a
Error (pooled)	167593.56	612	273.85	

^aF_{.99} (1, ∞) = 6.63

Table 7

Means and standard deviations of PPVT IQ scores by wave, treatment and test period.

	Pretest		Posttest 1		Posttest 2		N
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s	
Wave 1							
E	78.14	17.18	90.86	16.10	92.00	17.75	22
C _{SS}	67.67	17.91	67.11	16.27	76.56	13.19	9
Wave 2							
E	65.04	14.41	81.51	18.40	87.76	16.13	37
C _{SS}	68.62	18.24	70.31	22.69	83.00	17.45	13
Wave 3							
E	68.23	14.78	82.21	17.12	87.08	13.92	53
C _{SS}	66.20	11.06	71.20	16.79	79.50	21.90	20
Wave 4							
E	67.46	14.66	82.73	18.63	87.40	14.36	48
C _{SS}	68.30	11.63	72.50	13.40	74.90	13.16	10
All Waves							
E	68.63	15.54	83.39	18.00	88.01	15.24	160
C _{SS}	67.46	16.74	70.52	18.00	78.98	18.23	52

Table 8

CMMS IQ: Wave (1-4) x Treatment (E/C_{SS}) x Test Period (P/P₁/P₂).
 Analysis of variance with repeated measures, unweighted means
 solution:

Source	SS	df	MS	F
<u>Between S's</u>		178		
A (Wave)	45.44	3	15.15	< 1.00
B (Treatment)	2369.76	1	2369.76	7.37 ^a
AB	192.80	3	64.27	1.00
S's within grps.	54978.93	171	321.51	
<u>Within S's</u>		358		
C (Test Period)	1010.88	2	505.44	5.14 ^b
AC	1743.88	6	290.65	2.95 ^c
BC	188.80	2	94.40	< 1.00
ABC	1840.96	6	306.83	3.12 ^c
CxS's within grps.	33663.62	342	98.43	

$$^a F_{.99} (1, 200) = 6.76$$

$$^b F_{.99} (2, \infty) = 4.61$$

$$^c F_{.99} (6, \infty) = 2.80$$

Table 9

Simple effects analysis of AC interaction (Wave by Test Period)
CMMS data of Table 8.

Simple effects of <u>Test Period:</u>	SS	df	MS	F
for Wave 1	1432.00	2	716.00	7.27 ^a
for Wave 2	71.04	2	35.52	< 1.00
for Wave 3	12.80	2	6.40	< 1.00
for Wave 4	1238.56	2	619.28	6.29 ^a
Error (within)	33663.62	342	98.43	

^aF.99 (2, ∞) = 4.61

Table 10

Simple effects analysis of AC interaction (Wave by Test Period)
CMMS data of Table 8.

Simple effects <u>of Wave:</u>	SS	df	MS	F
for Test Period P	477.28	3	159.09	< 1.00
for Test Period P ₁	656.32	3	218.77	1.27
for Test Period P ₂	655.52	3	218.51	1.26
Error (pooled)	88642.55	513	172.79	

Table 11

Means and standard deviations of CMMS IQ scores by wave, treatment and test period.

	Pretest		Posttest 1		Posttest 2		N
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s	
Wave 1							
E	102.73	13.38	101.23	14.59	98.86	12.18	22
C _{ss}	103.89	16.65	89.67	11.54	90.78	9.41	9
Wave 2							
E	102.00	11.05	101.70	11.40	95.84	11.61	37
C _{ss}	95.92	10.30	92.62	8.35	98.38	15.52	13
Wave 3							
E	103.18	12.78	98.53	10.67	98.75	12.09	40
C _{ss}	93.56	18.20	98.25	13.50	99.56	17.00	16
Wave 4							
E	100.79	12.97	105.03	14.26	98.24	15.52	34
C _{ss}	98.25	9.01	98.25	12.06	88.13	4.75	8
All Waves							
E	102.17	12.51	101.52	12.78	97.83	13.00	133
C _{ss}	97.07	15.08	94.98	12.08	95.52	14.55	46

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